PRICE 50 CENTS

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

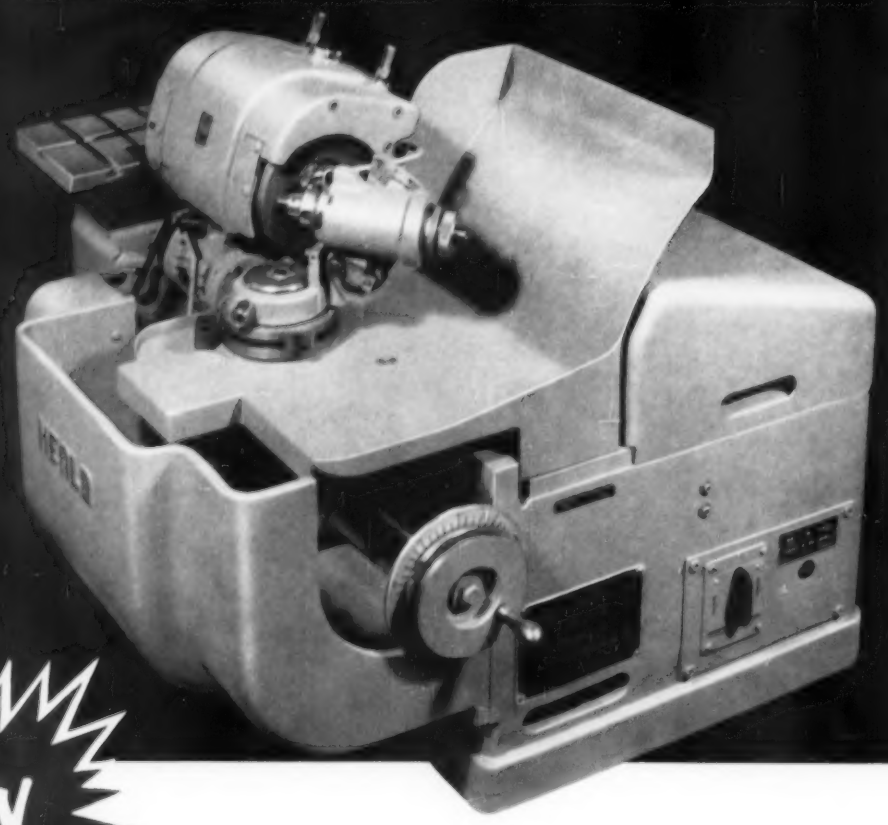
APRIL 9, 1956

Final checkout of telephone sets — *see page 2*

Tooling Behind the Telephone — A SPECIAL REPORT

Superalloy Forging • Magnesium Die Casting

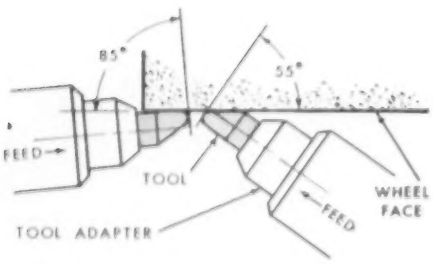
sharpen your tools with MACHINE PRECISION



new

HEALD MODEL 3 TOOL SHARPENER

saves time, gives longer tool life,
permits faster, more efficient borizing



The oscillating tool holder swings through an arc of up to 150°, to grind a maximum side angle of 85° on one side of the tool and 55° on the other side. Front clearance angles are adjustable from −10° to + 30° and tool radius can be set anywhere from 0 to 1¾". Precision calibrated scales eliminate guesswork and the mechanical machine cycle avoids any possibility of human errors or inaccuracies in the grinding operation.

LET's face it. Off-hand grinding just isn't precise enough for modern, high-speed borizing tools. To obtain maximum borizing efficiency, tools must be of the *precisely correct shape*—in complete conformity with *design specifications*.

With the new Model 3 Tool Sharpener, this requirement is met—and easily. Just dial the desired tool shape on the calibrated scales, clamp the tool in the holder and press the start button. Tool holder oscillation and wheel reciprocation are mechanically controlled, grinding up to five different angles and the radius with only an occasional hand adjustment for feeding the tool against the wheel. Precision is far greater than obtainable by off-hand grinding. What's more, any desired tool shape can be *exactly duplicated* again and again.

The mechanical precision built into this improved Model 3 machine assures a sharp, flawless cutting edge that will produce more and better work per sharpening. For complete details, send for Bulletin 2-4-2. IT PAYS TO COME TO HEALD!

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

Worcester 6, Massachusetts

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

HEALD ®

American Machinist

MAGAZINE OF METALWORKING PRODUCTION

CONTENTS FOR APRIL 9, 1956

Vol 100, No. 8

ADMINISTRATION

119 EDITORIAL *Burnham Finney*
161 TICK-TOCK TRIG *Round Table*

SPECIAL REPORT

137 TOOLING BEHIND THE TELEPHONE *George H De Groat*

TOOLING

125 FOUR MAGNESIUM PARTS CAST IN 15 SECONDS *Harry Eriksen, Clifford Johnson*
131 HOW TO DESIGN PUNCH PLATES *J R Paquin*
164 DOUBLE SPRING-LOADED TOOLING CUTS COMBINATION CAMS *J J O'Wril*
164 TAPERED GUIDE-PIN HOLES *Arturo Camacho*
164 TOOLBIT FROM DRILL CUTS RADIUSED FILLETS *R C Otterson*
165 BOLT-ON HEADSTOCK FOR 40-IN. SWING *W T Divine*
165 REALLY "LIVE" TAILSTOCK DRILLS CHUCKED WORK
167 SPECIAL GRINDING BLOCK PRODUCES CHASER LEAD-IN *William Hartmann*
167 AUTOMOBILE TIRE SECTIONS CUT LATHE CHATTER *G J George*
167 DOUBLE GROOVING BAR ADJUSTS FOR LATERAL SPACING *S George*
167 GEARED LATHE OSCILLATOR PRODUCES INTERNAL OIL GROOVE *N Smith*
168 ADJUSTMENT PLATE HELPS SET TAPER *A Wallace*
168 DRUM TAKEUP ON LATHE CUTS ODD THREADS *W H White*

MATERIAL CUTTING, FORMING

121 HOW SUPERALLOYS ARE FORGED *J E Connolly*
128 MAGNESIUM MOTOR PARTS ARE DIE CAST *R E Drury*
164 CUT THIN TUBING *Arturo Camacho*
166 DRILL ACCURATE OPPOSED HOLES WITH PRECISION ANGLE PLATE *A B Nixon*
166 "PENCIL-SHARPENER" HOLDER TAPERS DRILL ROD *J J O'Wril*
166 TURNED LATHE HEAD SWINGS 5-FT PATTERN *H H McNaughton*
168 WEDGE LOCK HOLDS CUPS *James Baird*
168 PROTECTS DIE POSTS WITH SPIRAL SPRINGS *Raymond Jones*
168 LOCK SOFT PARTS TOGETHER *Mark Bramsen*

ENGINEERING

162 BETTER SERVICE FROM BEARINGS

FINISHING

171 ABRASIVE-BLASTED SURFACES *W A Beyers*

NEWS OF METALWORKING

105 SPOT NEWS
107 WASHINGTON
109 DETROIT
111 MACHINE TOOLS
115 GAGING METALWORKING
178 NEWS OF METALWORKING
272 NAMES IN THE NEWS

DEPARTMENTS

98 BACKLASH
164 PRACTICAL IDEAS
171 REFERENCE BOOK SHEETS
192 EQUIPMENT, MATERIALS, PARTS
242 ROUND TABLE DISCUSSION
266 NEW BOOKS
268 NEW FILMS
192e NEW BULLETINS

NUMBER OF COPIES PRINTED THIS ISSUE 40,091

BURNHAM FINNEY editor
E J TANGERMAN executive editor

ANDERSON ASHBURN managing editor
RUPERT LE GRAND senior associate editor

BEN BROSHEER (Chicago) associate editor
H E LINSLEY associate editor
CHARLES D EMERSON associate editor
WM M STOCKER, JR associate editor
JOHN P WRIGHT associate editor
GEORGE H DE GROAT (Detroit) associate editor

ANN McTAGUE assistant editor
TOM JOHNSON assistant editor

RICHARD E ROOMAN art director
ANNE PALMER assistant
MATTHEW T HAGGERTY makeup

ROBERT SHEETS news editor
HARRY HOMEWOOD Detroit
ROBERT E COCHRAN Cleveland
MARGARET RALSTON San Francisco
JOHN SHINN Los Angeles
HAROLD HOOD Los Angeles
A R HENRY Atlanta
WILLIAM J COUGHLIN London
JOHN O COPPOCK Paris
PETER WEAVER Rio de Janeiro
GERALD W SCHRODER Bonn
DAN KURZMAN Tokyo
JOHN H KEARNEY Mexico City
DOUGLAS GREENWALD statistician
M K MATULIS assistant statistician

DEXTER KEEZER director economics dept.
GEORGE B BRYANT, JR chief Washington bureau
JOHN WILHELM editor world news
FRED H COLVIN editor emeritus

ALBERT HAUPTLI publisher
GEORGE REPPERT, JR advertising sales manager
RUSSELL T DOUGLAS business manager
CATHERINE C KANE manager, reader service

DISTRICT MANAGERS
W H Kearns Rhodes-Haverty Bldg, Atlanta 3
John H Koch 350 Park Square Bldg, Boston 16
Willard J Haring McGraw-Hill Bldg, Chicago 11
P F Pritchard McGraw-Hill Bldg, Chicago 11
Robert Anderson 1110 Delta Ave, Cincinnati 8
Robert Anderson Hanna Bldg, Cleveland 15
Richard H Burke Hanna Bldg, Cleveland 15
James Cash First Natl Bank Bldg, Dallas 1
Wm J Reichard Penobscot Bldg, Detroit 26
H L Keeler 1125 West Sixth St, Los Angeles 17
Gus H Krimsier McGraw-Hill Bldg, New York 36
John F Juraschek McGraw-Hill Bldg, New York 36
John Tiebout Architects' Bldg, Philadelphia 3
P F Pritchard Continental Bldg, St. Louis 8
Richard H Burke 719 Oliver Bldg, Pittsburgh 22
R C Alcorn 68 Post St, San Francisco 4

American Machinist is indexed regularly in the Engineering Index and the Industrial Arts Index

American Machinist, published bi-weekly, with an additional issue in mid-November, by McGraw-Hill Publishing Company, Inc, James H McGraw (1860-1948), Founder. EXECUTIVE, EDITORIAL, ADVERTISING AND PUBLISHING OFFICES: McGraw-Hill Building, 330 West 42nd Street, New York 36, NY. Donald C McGraw, President; Paul Montgomery, Executive Vice President; Joseph A Gerardi, Vice President and Treasurer; John J Cooke, Secretary; Nelson Bond, Executive Vice President, Publications Division; Ralph B Smith, Vice President and Editorial Director; Joseph H Allen, Vice President, Director of Advertising Sales; J E Blackburn Jr, Vice President and Circulation Director.

SUBSCRIPTIONS: Address correspondence to American Machinist-Subscription Service, 330 West 42nd Street, New York 36, NY. Allow one month for change of address. Subscriptions are solicited only from production executives and engineers in the metalworking industries. Position and company connection must be indicated on subscription orders.

Single copies, 50c. Subscription Rates — United States and possessions, $5 a year, $8 for two years, $10 for three years. Canada $7 for one year, $11 for two years, $14 for three years. Other Western Hemisphere and the Philippines, $15 for one year, $25 for two years, $30 for three years. All other countries $25 for one year, $40 for two years, $50 for three years. Second-class mail privileges authorized at New York, NY.

Copyright 1956 by McGraw-Hill Publishing Co, Inc — All Rights Reserved.

chips

page 137
TOOLING BEHIND THE TELEPHONE
First and exclusive report on advanced tooling methods of general interest from Indianapolis Works, Western Electric

PHONE CHECK . . . In a sense, you inspect a telephone everytime you make or receive a call—by using it. Although scores of mechanical and electrical tests are made during the manufacturing process, there must be one final inspection. Our cover shows an inspector at the Indianapolis Works of Western Electric making the final checkout on one of the new colored telephone sets—by using it.

TOOLING BEHIND THE TELEPHONE . . . Leading up to this final test of almost 6 million phones a year are production methods that include stamping, machining, testing, plating, assembling, die casting, and molding. Tooling details for these operations have been—until now—one of the few unreported areas in Metalworking.

FULL COOPERATION . . . When Western Electric opened the doors of its Indianapolis Works to a working editor, the full cooperation of the engineering staff was given to Associate Editor George De Groat. From the hundreds of parts that make up the various types of telephones, the tooling that is most interesting and of broadest application has been chosen. The 24-page Special Report that results will repay careful reading. You may find in it an idea, or several ideas, that you can apply in your own plant to help you stem the ever-rising tide of production costs.

SUPERALLOY FORGING . . . Forging to nearly finished size is both more important and more difficult with the hard-to-machine superalloys than with more conventional metals. Several years of pioneering work in this field by Super Alloy Forge, Inc, led to the development of new methods of precision forging. They are described in detail in our lead article by the man chiefly responsible for them—company president John E Connolly.

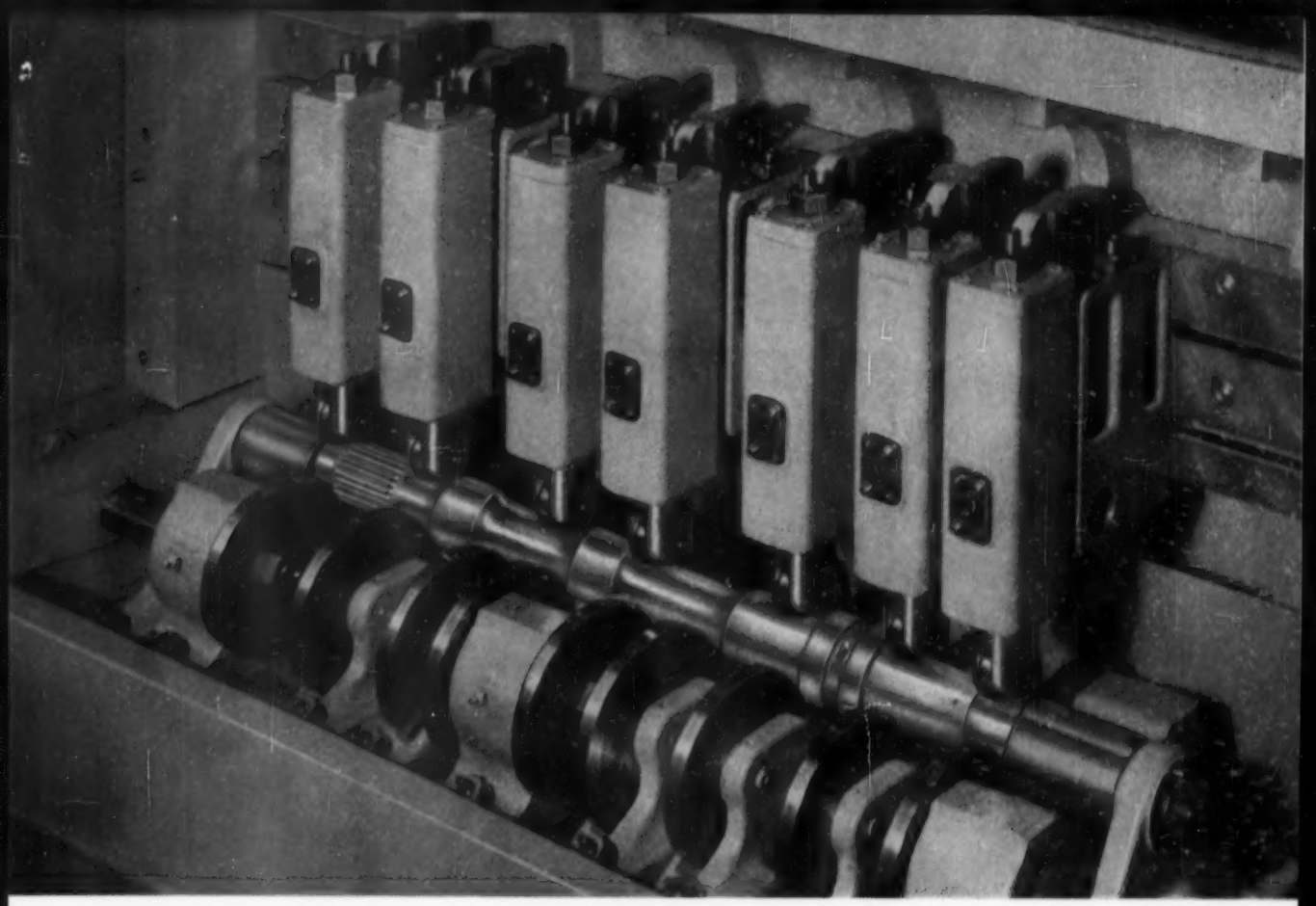
MAGNESIUM DIE CASTING . . . No longer must magnesium be ladled by hand into the die-casting machine for each shot. With the application of hot-chamber methods, traditional for zinc, magnesium production can be increased and cost cut. In two articles, we bring you details of the first commercial applications of the process. The first describes the method and its application at AC Spark Plug Div of General Motors Corp; the second tells how operations were changed at the Redmond Corp with hot-chamber castings produced by Dow.

PUNCH PLATE DESIGN . . . Fifth of the steps in die design deals with the plates to support piercing, notching, and cut-off punches. J R Paquin outlines the prime factors and illustrates 20 methods of designing punch plates and applying them to various types of dies. This article continues the series amplifying each of the "Fourteen Steps To Design a Die" (*AM*—Oct 10 '55, p129).

FORGING STANDARDS . . . Reference Book Sheets are so well established with readers that we rarely call attention to them in this space. But don't overlook them. Typical is the series starting in this issue that covers a forthcoming standard for forging drawings. Developed by ASME, this important tentative standard will be reported in a series of five Reference Book Sheets.

BEARING PROBLEMS . . . Even though you buy best possible grades of ball bearings, you can't be sure of trouble-free operation if you don't take into account the many factors that can produce operating difficulties. Points to be considered include bearing selection, mounting, fit, alignment, lubrication, and maintenance. In a two-page article.

COMING . . . *AM* for April 23 will include a Special Report on the latest techniques in silver brazing. There'll be articles on electrical discharge machining, standard and special machines that team up to produce compressor components, a tool dynamometer for checking "throw-away" tools, and straight-polarity welding. Plus Practical Ideas, Reference Book Sheets, and all the other useful departments.



How to eliminate *your* shaft distortion problems

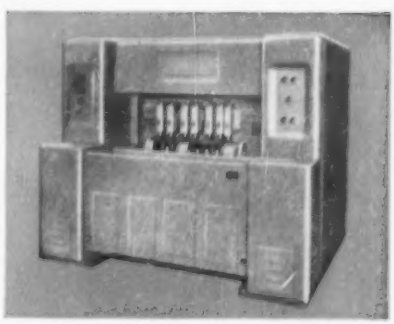
Distortion during hardening is a major production problem.

The Gleason No. 140 Rolling Quench Machine corrects this difficulty, because the quenching and straightening operations are performed at the same time. Because cold straightening is eliminated, valuable production time and expense are saved, and the quenched parts have less residual stress.

Shafts cannot distort because they are rolled under pressure throughout the quenching operation. The operator puts the hot part on the lower rollers and starts the machine. From there on, the quenching operation is automatic. Rolling speed, pressure, and oil flow are pre-set to suit the work that is being quenched.

The automatic quenching cycle saves operator time, and gives *uniform* results for all parts quenched. The pre-set metallurgically correct oil flow gives uniform hardness.

The Gleason No. 140 Rolling Quench Machine is equally suited for small or large quantities. It accommodates shafts $\frac{9}{16}$" to 4" in diameter, 6" to 40" in length, with integral cams or shoulders up to 8" diameter. Tooling can be arranged to hold parts on diameters or centers. Unusual shapes can be handled with additional tooling. Write for further information.



The Gleason No. 140 Rolling Quench Machine also handles multiple quenching of short shafts.

GLEASON WORKS

Builders of bevel gear machinery for over 90 years

1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

A Head for

CINCI NATI **CINCIN**

Low-Cost Production

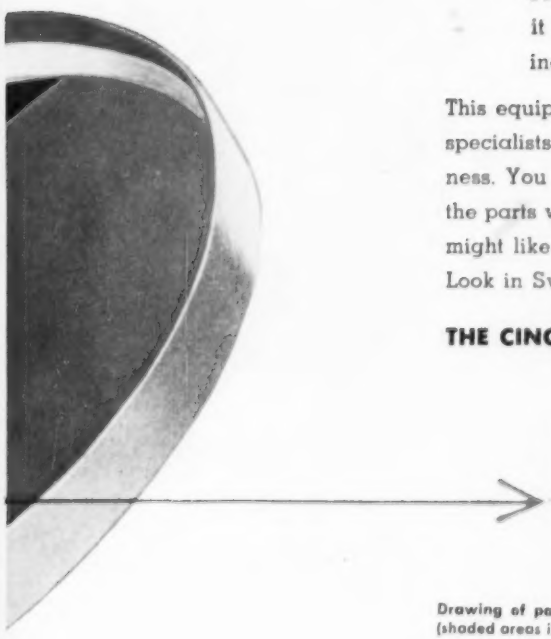
. . Duplex Head on Cincinnati 0-8 Plain Rise and Fall Mills an Extra Surface

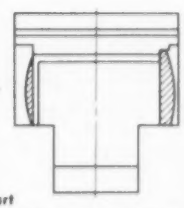
This machine has a head for business. It's a CINCINNATI® No. 0-8 Plain Rise and Fall Milling Machine, equipped with a duplex head to mill **both sides** of small parts in **one cycle**, and **one handling** of the work.

Production averages 223 parts per hour, about double what it would be without the Duplex Head. The drawing below indicates surfaces milled.

This equipment is the work of Cincinnati Application Engineers, a group of specialists who help metalworking industry reduce the cost of doing business. You can enlist their aid by sending blueprints and complete data on the parts which you suspect of being high-cost components. Meanwhile, you might like to know more about the highly productive 0-8 Milling Machines. Look in Sweet's Machine Tool File, or write for catalog No. M-1607-2.

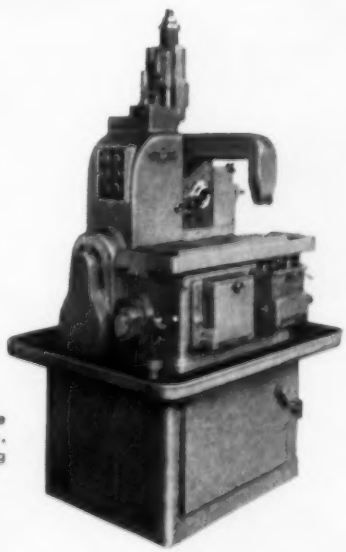
THE CINCINNATI MILLING MACHINE CO. • CINCINNATI 9, OHIO





Drawing of part
(shaded areas indicate milled surfaces)

Part name . . . . . rear sight base
Material . . . . . steel forging
Operation . . . . . mill two sides
Production . . . . . 223 per hour



CINCINNATI No. 0-8 Plain Rise and Fall Milling Machine. Complete specifications in catalog No. M-1607-2.

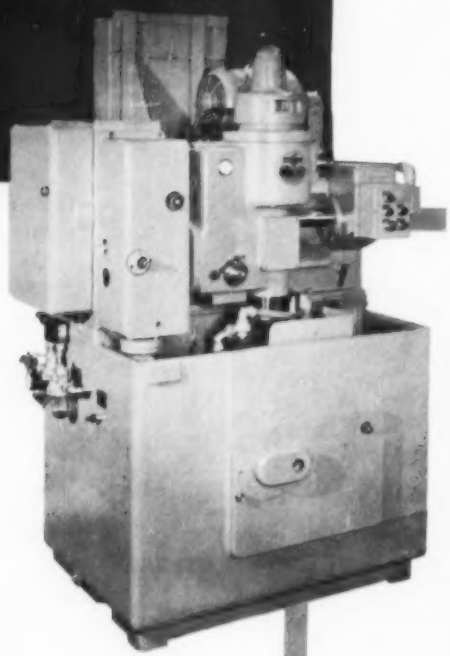
NATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

HIGH-PRODUCTION TEAM . . . . . .

Fellows 36-Type Gear Shaper:

produces gears up to 36" p.d., 6" face width.



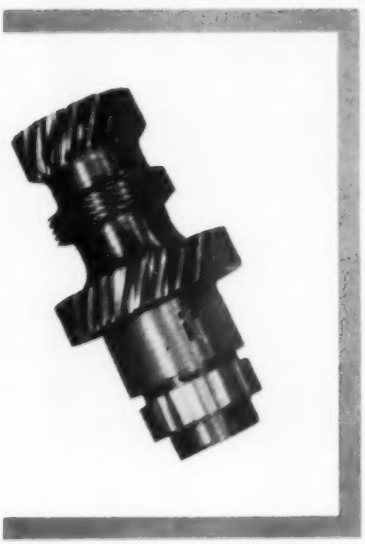
Fellows No. 4 GS Gear Shaper:

produces gears up to 6" p.d., 2" face width.

THE PRECISION LINE

. to meet your gear-cutting needs

. . . up to 36″ p.d.



With these two high-speed, close-tolerance machines you can cover the whole range of your spur and helical gear production requirements . . . offering maximum capacity at a reasonable investment.

The new Fellows No. 4GS Gear Shaper finish-cuts internal and external spur and helical gears up to 6″ p.d. and 2″ face width, at 9 cutter speeds from 98 to 635 strokes per minute! It can be used for general purpose gear cutting or adapted to semi-automatic or completely automatic operation for large production runs. Rigid mechanism assures high speed with close tolerances. Rotary feeds from 0.008″ to 0.028″ based on 4″ p.d. cutter

The Fellows 36-Type is a powerful machine that can hold close tolerances while taking extra heavy cuts on internal or external spur, helical, or herringbone gears up to 36″ p.d. and 6″ face width. Cutting speeds from 18 to 300 strokes per minute. Matched to modern needs for fast set-ups and quick, easy adjustments. Versatility permits wide-spread use cutting cams, splines, and special contours, too.

Get full information about this profitable team from your Fellows representative. And ask him about the Fellows Plan for deferred payment. WRITE, WIRE or PHONE any Fellows Office.

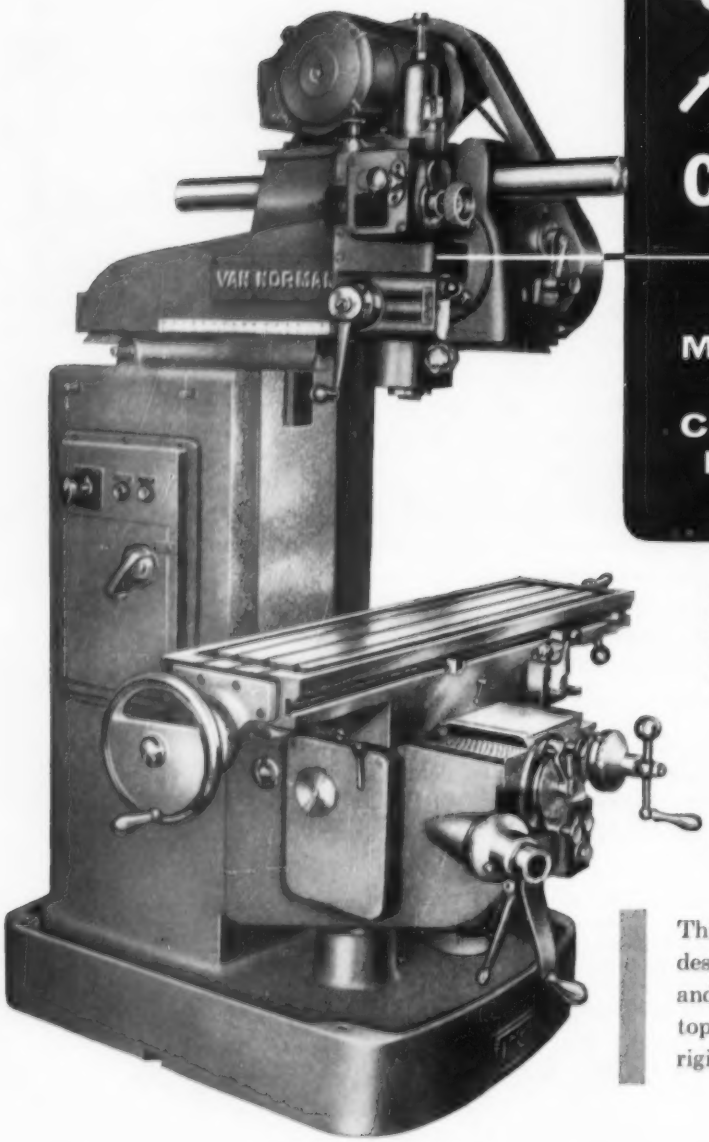
● THE FELLOWS GEAR SHAPER COMPANY,
78 River Street, Springfield, Vermont.
Branch Offices: 319 Fisher Building, Detroit 2
5835 West North Avenue, Chicago 39
2206 Empire State Building, New York 1
6214 West Manchester Avenue, Los Angeles 45

Fellows *Gear Production Equipment*

New VAN NORMAN

WITH THE QUILL-TYPE *Adjustable* CUTTERHEAD

Gives you MORE VERSATILITY PLUS MORE Cutability than Single Purpose Machines



No. 16S
Quill Travel: 4"
Quill Power Feed: .0015; .003; .006
22" Power feed to table
Cutterhead Spindle Motor: 2 HP

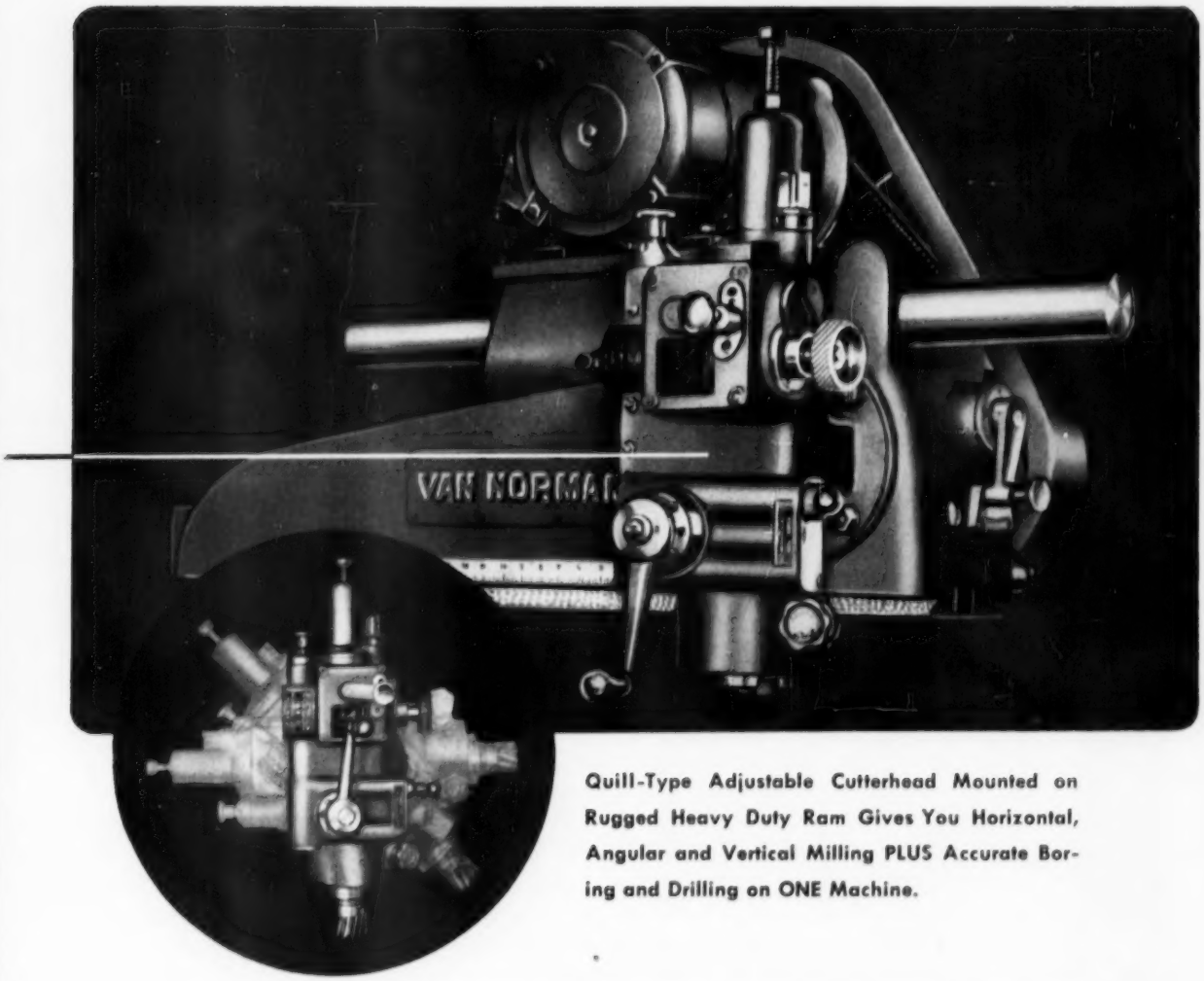
You can own this machine for as little as $4.98 per day

This new Van Norman Ram Type Miller is designed to increase your milling production and reduce milling costs. Entirely new from top to bottom, it is engineered for maximum rigidity, cutability and accuracy.

VAN NORMAN MACHINE

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

No. 16S Ram Type Miller



Quill-Type Adjustable Cutterhead Mounted on Rugged Heavy Duty Ram Gives You Horizontal, Angular and Vertical Milling PLUS Accurate Boring and Drilling on ONE Machine.

A single investment in this one miller gives you the equivalent of two single purpose machines plus attachments at the much lower cost of a single machine. It is available in both plain and universal models. *Write for complete details today.*

Don't wait . . . for extra profits install a Van Norman now! They are available on five purchase plans — Outright sale . . . Purchase on conditional sales contract up to 5 years . . . Pay as you depreciate . . . Straight lease . . . Lease with option to buy. See your dealer or write Van Norman Company.

Lease and Conditional Sales Contracts not available to Export.

Write for complete details today.

COMPANY | **SPRINGFIELD 7, MASSACHUSETTS**

3/4"- 4.320" threading range

. . . with one LANDMACO Machine

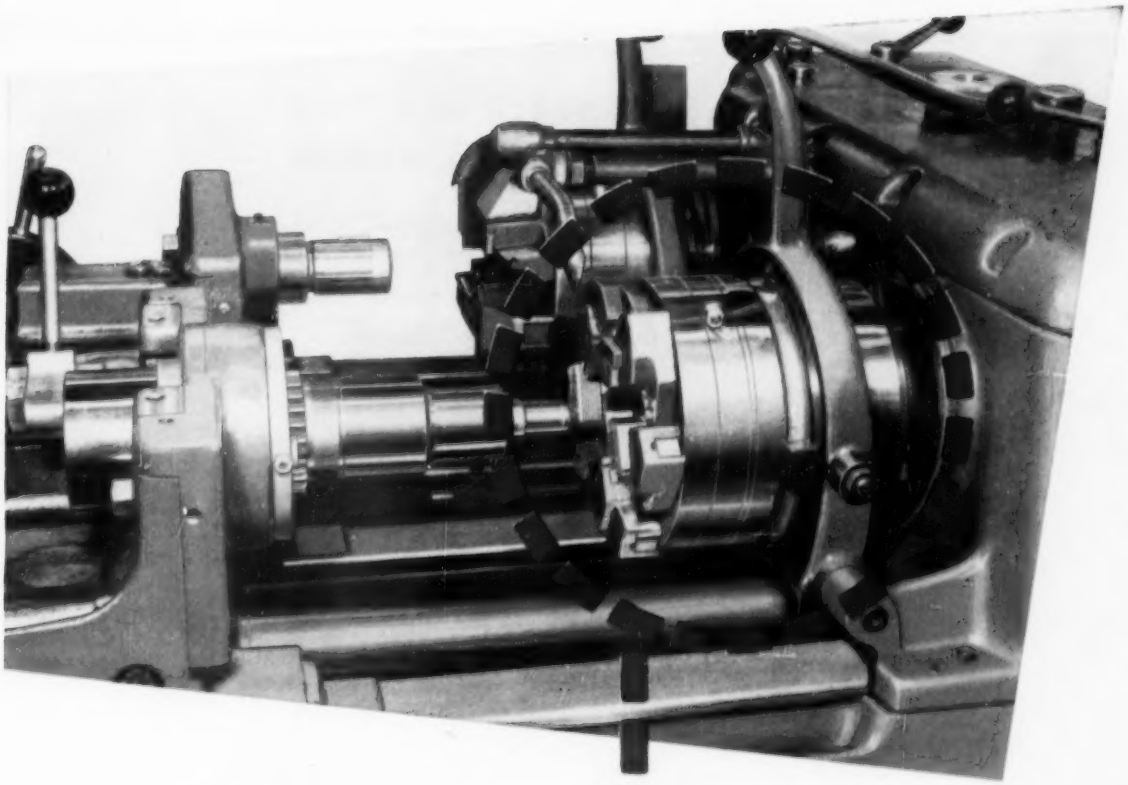
The Twin Disc Clutch Company Hydraulic Division in Rockford, Illinois, is able to thread a wide variety of work from 3/4"-32 pitch to 4.320"-12 pitch with just one LANDMACO Threading Machine.

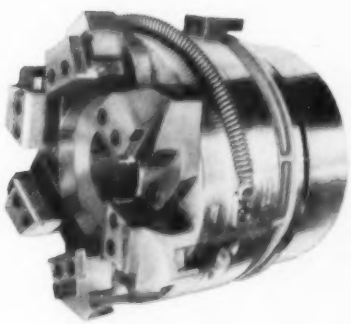
A six-chaser 40RX LANCO Head with a range of $2\frac{1}{2}$" to $9\frac{1}{4}$" (5-1/8" bore) is mounted on the right-hand spindle to produce fine-pitch large-diameter threads. A $2\frac{1}{2}$"R LANCO Head with a range of $\frac{1}{2}$" to $2\frac{1}{2}$" is used on the other spindle to produce coarse-pitch threads, small-diameter threads, and long thread lengths.

One of the many different operations performed by this equipment is illustrated—threading clutch output shafts with the 40RX Head. The workpiece is made from C1045 steel, heat-treated to 229-269 Brinnell hardness. A special 12-pitch UN Thread, with a 3.669"-3.676" pitch-diameter tolerance, is cut .830" long to within $\frac{1}{4}$" of the shoulder. 15 pieces are threaded per hour, including 100% inspection by gauging on the machine. Even with heat-treated material and exacting thread finish requirements, 100 pieces are completed between chaser grinds.

The different types of special workholding fixtures designed for these short-run operations at Twin Disc are a major factor in the versatility of the equipment used. For example, in the operation illustrated, a special carriage front allows this LANDMACO Machine to thread a workpiece with a diameter well beyond its normal range. These special fixtures may be used interchangeably with the standard vises.

This installation shows how LANDIS Equipment and Engineering can combine to economically solve a problem in Thread Production. May we suggest the most efficient method for producing your Threads?





For additional information:

* on the many types and styles of LANDIS Die Heads, ask for Bulletins F-80 or F-90
* on LANDMACO THREADING Machines, ask for Bulletin H-76.

THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT · CUTTING · TAPPING · GRINDING · ROLLING

LANDIS *Machine* COMPANY

WAYNESBORO • PENNSYLVANIA • U. S. A.

Landis microsphere bearings speed

Exclusive Landis microsphere bearings on both grinding and regulating wheels

Landis No. 12 Centerless Grinder

LANDIS

precision grinders

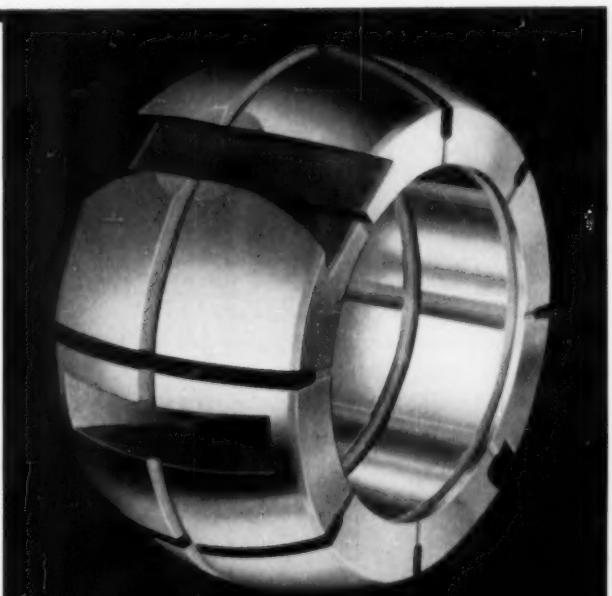
centerless production... lower costs

Quick, positive sparkout
. . . for faster grinding cycles

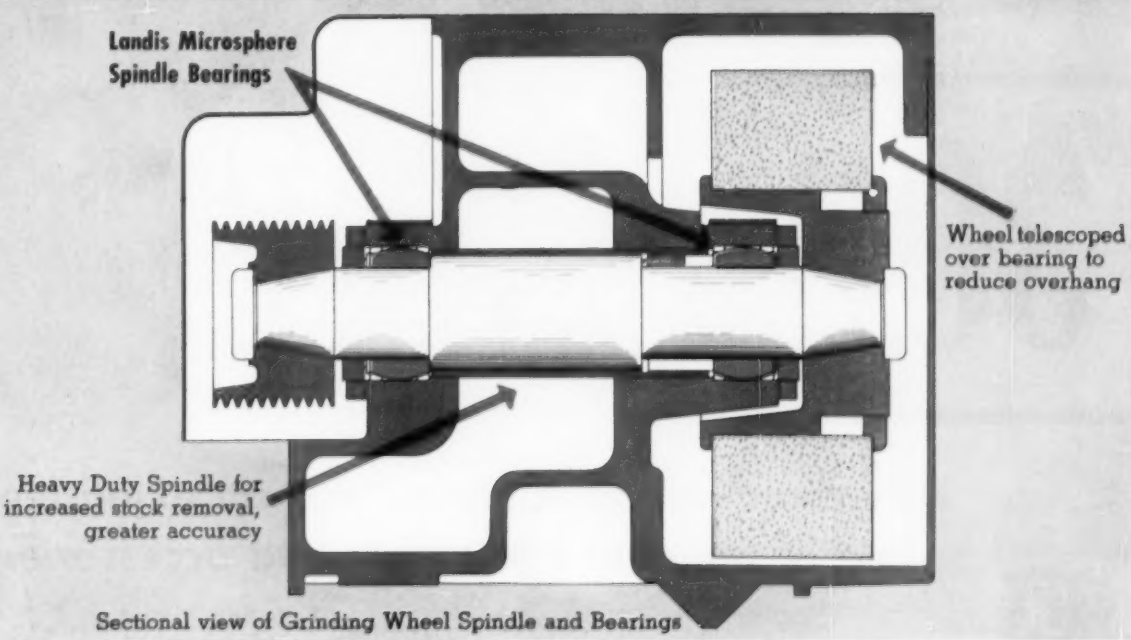
Close running clearance
. . . for fine finishes

Simple, one-piece construction
. . . trouble-free operation

Increased rigidity
. . . heavier cuts to closer tolerances



Landis Microsphere Bearing



Sectional view of Grinding Wheel Spindle and Bearings

LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA

Today's *Smartest* approach to more profitable metalworking

UNLIMITED profit-making opportunities begin with Giddings & Lewis 300-T (table-type) horizontal boring, drilling and milling machines. Acclaimed the most versatile machines for their size ever built, they're capable of performing a host of machining operations with efficiency and precision. And you get even greater production results from a combination of attachments and accessories — designed to increase the normal working range of the machine.

The 300-T machines (with 3-inch diameter spindle) are available with standard or built-in revolving tables with a wide variety of working ranges. Machines also feature rigid saddle supports . . . in-the-floor or over-the-floor type auxiliary runways . . . large bearing surfaces between the headstock and column which permit the machine to work at full capacity at the extreme limits of travel.

What's more, its 45 optional spindle speeds and 18 feeds in any speed range, augmented by a total of 23 milling feeds, exceed the requirements of modern shop practices and available tooling development. Find out how the 300-T outperforms any other horizontal built today.

Write for literature: **For complete specifications on Giddings & Lewis Models 300-T (table-type) and 300-RT (rotary table-type) machines, ask for Catalog No. 300-T.**

300T table type

Giddings & Lewis

horizontal boring, drilling and milling machines

Advanced design features plus an extensive line of optional equipment and accessories

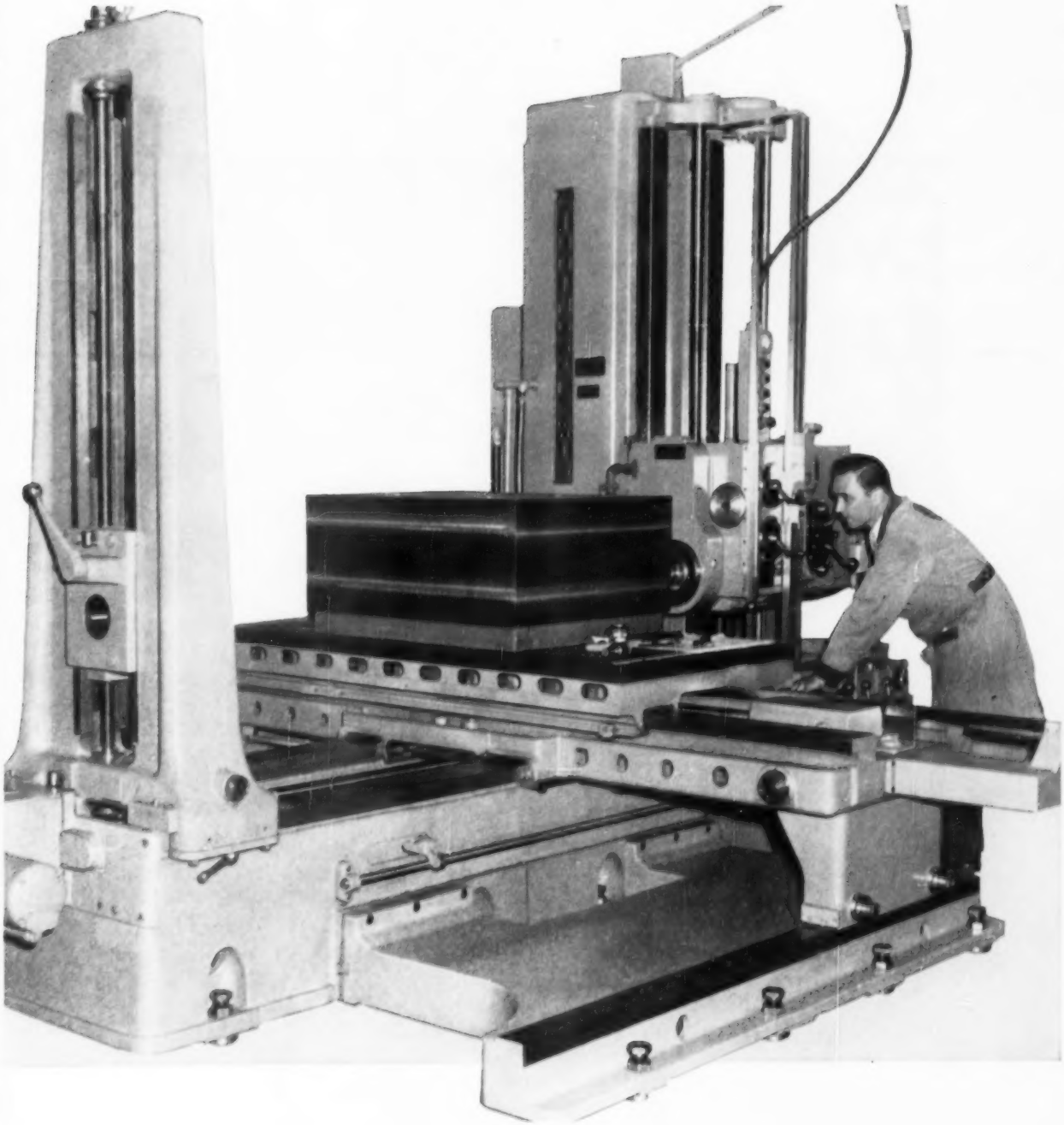
G & L *and* HYPRO DIVISION

GIDDINGS & LEWIS MACHINE TOOL CO.

Fond du Lac, Wisconsin

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Vertical Turret Lathes; Spar and Skin Milling Machines, and VARIAX Machines.

G-59



EXTENDED SADDLES, SADDLE SUPPORTS and AUXILIARY RUNWAYS assure maximum rigidity and accuracy under heaviest loads . . . available with in-the-floor or over-the-floor auxiliary runways.

HEADSTOCK, TABLE, SADDLE operate independently in both directions of travel. Directional controls provide for easier operation of machine units. Heavy, box-type ribbing in column assures extra-rigidity for headstock.

SURFACE HARDENED WAYS on the bed and saddle prevent scoring and galling . . . assure longer-lasting accuracy.

COMPLETE SEPARATION OF CONTROLS plus color-coded, speed and feed dials simplify machine operation . . . considerably reduce floor-to-floor time.

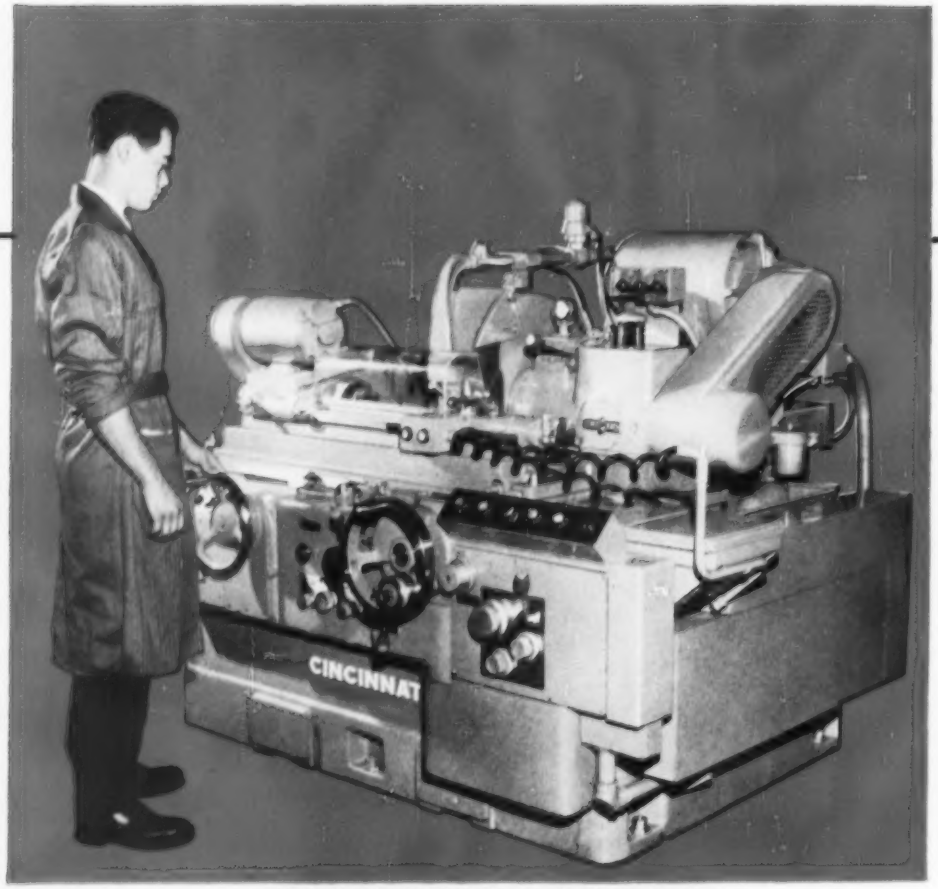
PENDANT STATION with push-button controls permit machine operation at any point within operator's normal working range.

PRECISION MEASURING DEVICES are available for movement of headstock, table and saddle.

ANGULAR MILLING ATTACHMENTS permit many different milling, boring, reaming and similar operations.

CONTINUOUS FEED FACING HEAD simplifies unusual or complex work where surfaces to be machined are beyond normal range of machine.

AUTOMATIC ELECTRIC POSITIONING DEVICE accurately selects, maintains and controls distances between machined holes. Makes possible positive machine settings for boring operations repetitive to .0002"



CINCINNATI FILMATIC® 6"R x 18" Plain Hydraulic Grinding Machine equipped with automatic push-button infeed and electric gage sizing. Members of this family group of CINCINNATI Grinders are:

Size	Between-Center Lengths	Catalog
6"R 10"L	18" and 30"	G-660
10"R 14"L	18", 36", 48" 72" and 96"	G-661

FILMATIC

CINCINNATI

CINCINNATI

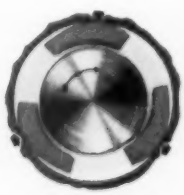
CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES

You'll get precision to the "NTH" DEGREE

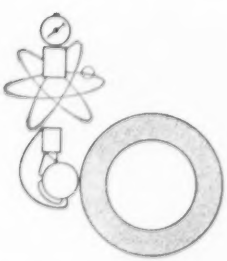
...and consistently high production, too!

Speculation in precision and production has no place in today's metalworking shops. You can quickly end the guesswork where it hurts most . . . in your precision cylindrical work. Just install new CINCINNATI FILMATIC Plain Hydraulic Grinders in your shop and you'll have definite production that you can count on year after year, and within closer limits of accuracy than ever before. ¶ Four Cincinnati features that help you attain these highly desirable results are illustrated below. These and many other features, translated into benefits for your shop, are outlined in two attractive catalogs: G-660 for the 6"R and 10"L machines; G-661 for the 10"R and 14"L machines. Write for copies.

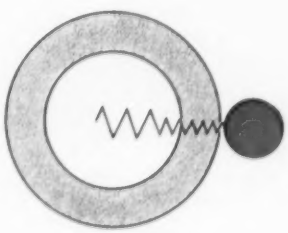
CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO



Grinding Wheel Balancing and FILMATIC Grinding Wheel Spindle Bearings are standard equipment. (FILMATIC principle illustrated at the left.) These two cost-reducing features alone are reason enough to choose Cincinnati.

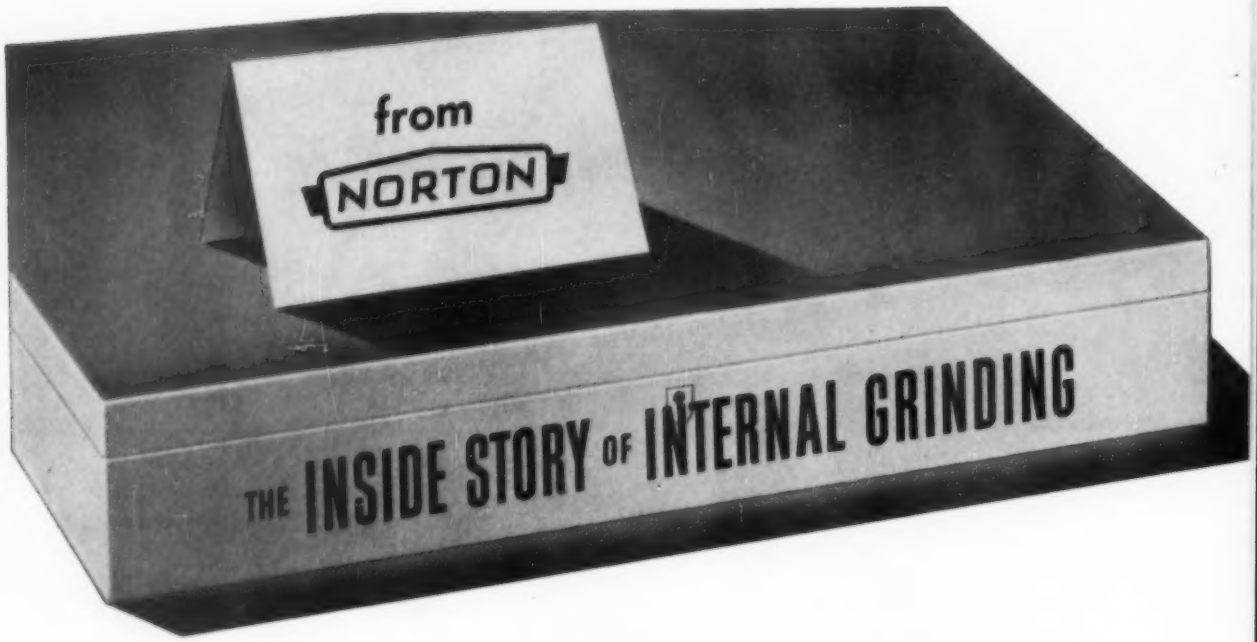


Automatic electric gage sizing (extra) includes an exclusive Cincinnati advantage . . . automatic compensation for wheel wear and truing.



Gap eliminator . . . greatly reduces time spent in "cutting air" during automatic infeed grinding operations. (extra)

CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES



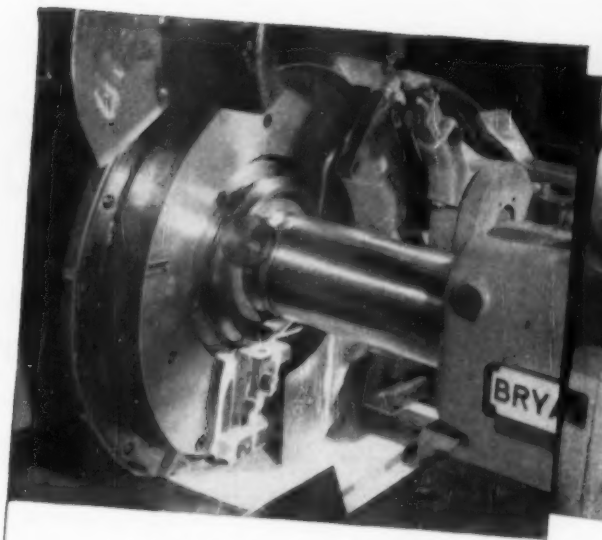
How Norton wheels add the **"TOUCH of GOLD"** *across the range of internal grinding jobs*

Take a Good Look at Precision

It's easy to see why Norton internal grinding wheels are such outstanding precision performers. They're precision-built, by an exclusive process that results in absolutely uniform grinding action in wheel after wheel of the same specifications. This means that when you change wheels you have no adjustments to make, the new ones give you the same fast, cool-cutting performance. And you can add this time-saving, productimproving "Touch of Gold" to every internal grinding job you do, because Norton wheels are made in types and sizes for every application.

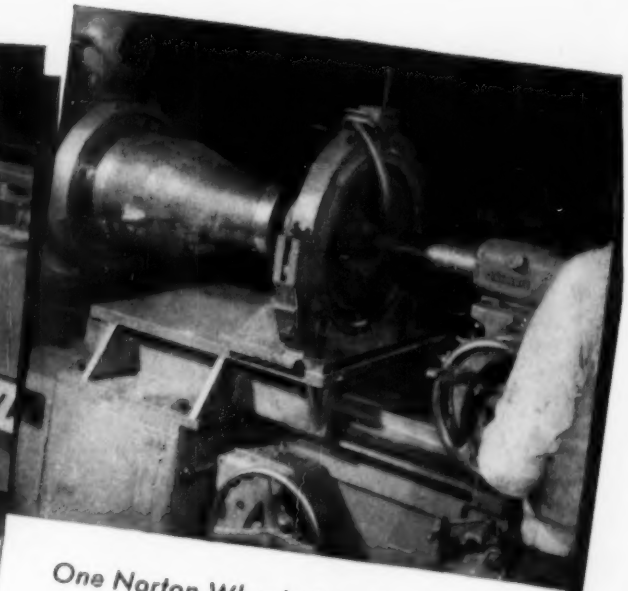
The G Bond Has No Equal

No other vitrified bond ever developed can match the Norton G Bond for efficiency and economy in precision and semi-precision grinding applications. It holds abrasive grains until each has done its full share of the work, keeping the wheel's cutting surface at constant peak efficiency. That's why G Bond wheels cut freer and faster; produce finer finishes, dress easier and do more work per dressing and per wheel. On many jobs the G Bond and 32 ALUNDUM® abrasive — recommended for heavy feeds and fast stock removal — make the ideal "Touch of Gold" team for profitable precision grinding.



How Close Can You Get?

With the right Norton wheel you meet closest tolerances in the shortest possible time. The performance data on this precision job tells you why. The Norton wheel is grinding an inner bearing race of 52100 steel. *I.D.:* 5.5118". *Stock removal:* .005" to .007". *Limits:* +.0000", −.0001". *Finish:* 10 microinches RMS. *Time:* 90 seconds.



One Norton Wheel—Two Good Jobs

In grinding this trunnion, one Norton wheel is used on both ends. Material is stainless steel No. 304. The larger hole measures 13 1/16" I.D. x 4" long; the smaller is 5 1/2" I.D. x 4" long. Stock removal from each end is .015", to tolerance limits of ±.0002". Four complete trunnions — eight grinding jobs — are done each day.

A Mighty Fine Finish

This Norton wheel is grinding a bearing sleeve of 52100 steel, 62 to 63 Rockwell C. The hole is 3 1/4" I.D. x 4 23/32" long. From .005" to .006" of stock is removed, within limits of +.0008", −.0000". The surface is finished to 4 microinches RMS and grinding time is 30 minutes each.

Ask Your Norton Distributor

to arrange a test of these top-performing "Touch of Gold" internal grinding wheels in your plants. Or write direct to your nearest Norton district office. And remember: only Norton offers you such long experience in both grinding wheels and machines. NORTON COMPANY, Worcester 6, Mass. Offices in nine cities. Distributors in all industrial areas — listed under "Grinding Wheels" in your phone directory, yellow pages. Behr-Manning, Troy, N.Y., division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

NORTON

ABRASIVES

Making better products... to make your products better

NORTON products: Abrasives • Grinding Wheels
Grinding Machines • Refractories

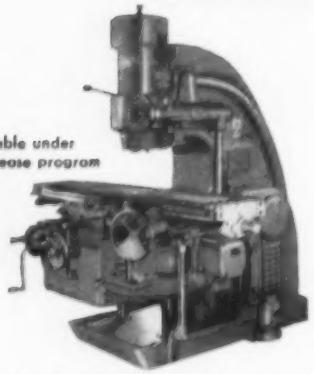
BEHR-MANNING products: Coated Abrasives
Sharpening Stones • Pressure-Sensitive Tapes

W-1686

*Trade-Mark Reg. U.S. Pat. Off. and Foreign Countries

Now Kearney & Trecker has

Standard equipment on new TF Series milling machines — front-mounted for faster table settings... positioned to prevent costly errors



Available under Tool-Lease program

TF Series Model 550 Vertical Milling Machine

POWER — 50/25 spindle drive; 5hp feed and rapid traverse drive
TABLE WORKING SURFACE — 96" x 18"
FEEDS — (32) 5/8" to 90"
SPEEDS — (16) single-speed, (32) two-speed
WEIGHT — 17,600 lbs.

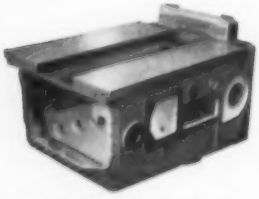
THE front-mounted table handwheel is a standard feature on all Kearney & Trecker new TF Series, knee-type milling machines — Plain, Universal and Vertical. Mounted on the right front of the saddle and projecting diagonally, the newly positioned handwheel is a part of Kearney & Trecker's up-front central control grouping.

Because the handwheel is ideally located so as to simplify operation of the machine, the operator makes table settings more accurately — in less time and without leaving his normal operating position. It measurably reduces operator fatigue.

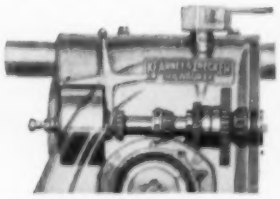
In addition, the new TF's give you a combination of more outstanding design and operating features (illustrated below) than any other knee-type milling machine on the market today. They're available in five sizes — No. 2 to No. 6 from 10hp to 50hp.

For complete specifications, and what these TF's can do for you, see your nearest Kearney & Trecker representative, or write direct to Kearney & Trecker Corp., Milwaukee 14, Wisconsin.

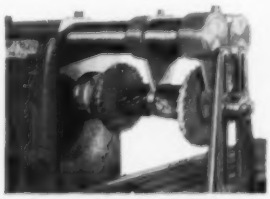
5 more reasons why TF Series milling machines are so easy to operate



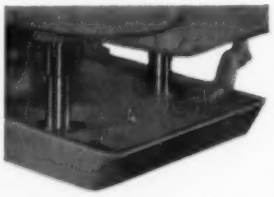
Heavier, Wider, One-Piece Knee — The *Twin Screw* arrangement supports the heavier, larger knee. Span and length of ways is increased considerably, providing fuller saddle support . . . longer-lasting accuracy.



Three-Bearing Spindle — Complete assembly consists of three heavy-duty bearings, fly-wheel, train of wide-faced forged steel gears. Rigidity of spindle unit contributes to increased cutter life and quieter operation.



Double "Vibra-Void" Overarms — Two solid steel bars, mounted completely through column, void vibration at source, afford more rigidity and resistance to deflection. Design also greatly simplifies changing of arbors and cutters.



Twin Screw Knee Support — Exclusive double-support arrangement most effectively distributes weight of the new machines' much larger, wider, heavier knee, saddle and table. This balanced design substantially increases stability under heaviest loads . . . offers greater resistance to torsional thrust under all cuts . . . halves the wear factor, assuring greater, longer-lasting accuracy.

KEARNEY & TRECKER CORP.
6786 W. National Ave., Milwaukee 14, Wisconsin

Please send me Catalog No. TF-50 with details on the new line of TF Series Plain, Universal and Vertical milling machines.

Name.....

Title.....

Company.....

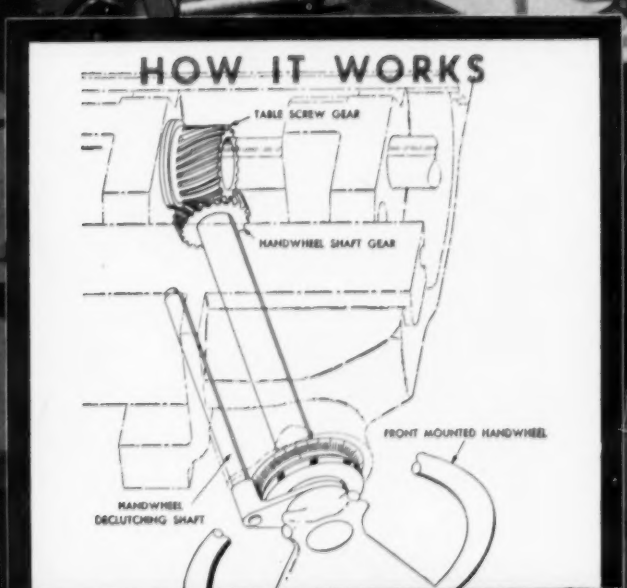
Address.....

City.....Zone.....State.....

Massive Column — Solid back, double-box section column is scientifically ribbed throughout to rigidly withstand heaviest cutting forces. Full bearing column face affords maximum support for the knee. Cross-mounted motor assures maximum ventilation, easy access for routine maintenance.

(convenience-engineered)

Front-Mounted Handwheel

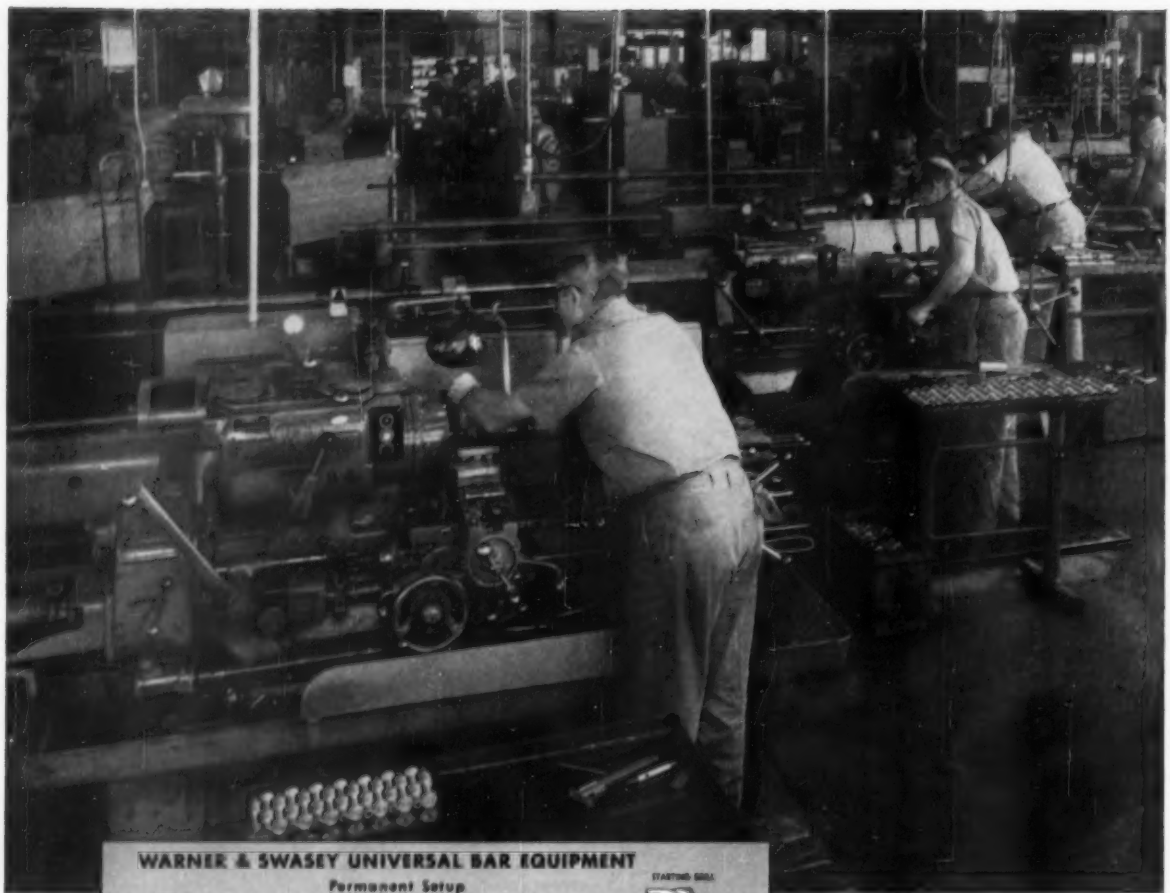


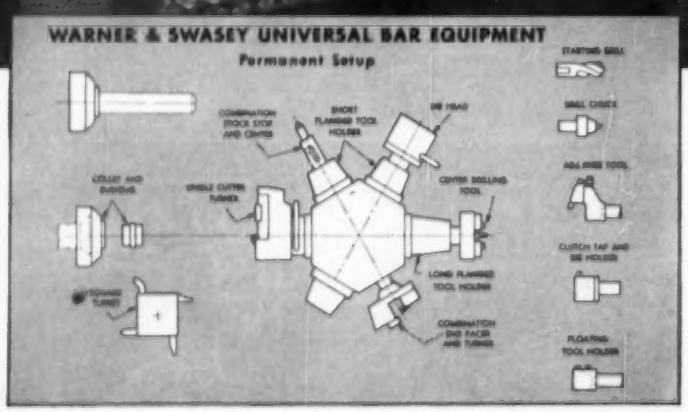
KEARNEY & TRECKER
MILWAUKEE

BUILDERS OF
PRECISION AND PRODUCTION MACHINE TOOLS SINCE 1898

Here's a real case of

SMALL LOT





Warner & Swasey Standard Tools are quickly interchangeable for simple and complex jobs—in large or small lots—thus minimizing your tooling costs.

PRODUCTION

on No. 3 turret lathes at CAMCO, INC.

CAMCO, INC., Houston, Texas, depends on Warner & Swaseys for small lot production of parts for their gas lift valves—equipment which lifts petroleum from oil wells whose natural forces are exhausted.

Two of these nine Warner & Swaseys are standard tooled No. 3 turret lathes which machine a wide variety of simple to complex parts from stainless steel and monel metal, in lots averaging 50 pieces. Tolerances as low as .002 are held on most jobs.

One of the No. 3's is also equipped with a full length lead screw and selective gear box to machine numerous small lot threading jobs. The threads are chased with the lead screw and an automatic knock-off attachment. Specification of the threads: standard vee or round form, special diameter, standard pitches, Class 3.

Since the day the first No. 3 machine was installed in 1954, working two 9-hour shifts per day, not one hour has been lost because of downtime for repairs! Similar performance has been achieved by their other Warner & Swaseys—No. 4 and No. 5 turret lathes, 2-A and 4-A heavy duty turret lathes, and two 5-spindle automatics.

This story again illustrates a point recognized in our customers' plants throughout the world—for dependable day-after-day production of small lots, you can't beat the versatility and accuracy of standard tooled Warner & Swasey Machine Tools!

CAMCO MACHINES A WIDE VARIETY OF PARTS LIKE THESE IN 6 TO 100 PIECE LOTS

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

From the World's Most Complete Line . . . your

MORSE-FRANCHISED DISTRIBUTOR

can recommend the correct cutting tool for every job in your plant . . . regardless of tool requirements

There's the whole Morse story right there in a nutshell. And it simply means that whatever you need for any job . . . carbon, high-speed or tungsten carbide, you can get it from your Morse-Franchised Distributor.

What's more, it means that Morse can give you, consistently, the lowest cost-per-cut you ever experienced. That's why it always pays to call your Morse-Franchised Distributor . . . because he's the one man who can give you "The Most" in cutting tools . . . and that means nobody (*but nobody*) but Morse! *Call him now.*

MORSE TWIST DRILL & MACHINE COMPANY
New Bedford, Massachusetts
Subsidiary of VAN NORMAN INDUSTRIES, INC.
Warehouses in New York, Chicago, Detroit, Dallas, San Francisco

that's why **MORSE**

Buy them by phone from your Morse-Franchised Distributor and save ordering time

HIGH SPEED
MORSE
MORSE
MORSE
TUNGSTEN CARBIDE
MORSE
MORSE
MORSE
MORSE
MORSE
MORSE
means "THE MOST"
in Cutting Tools

engineered for HIGH PRODUCTION LAPOINTE electro-motive drive

are all built with proper weight... they're HEAVY, RUGGED, RIGID!

You need a lot of *weight* — plenty of "beef" — in a broaching machine equipped with electro-motive drive. And in the six machines comprising the Lapointe line, the *weight-rigidity factor* is largely responsible for several outstanding advantages: Amazing smoothness of operation • increase of tool life 400% and more • saving of downtime caused by excessive tool changeovers • substantial improvement in finish • assurance of maximum accuracy.

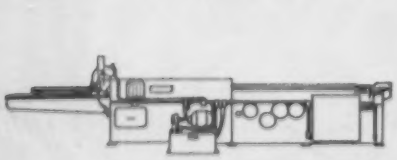
If you are thinking about a part that you would like to see *broached*, so as to increase your production at an amazing rate while also improving the finish and lowering production costs, come to Broaching Headquarters . . . come to LAPOINTE!

THE LAPOINTE MACHINE TOOL COMPANY

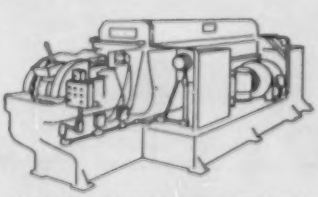
HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

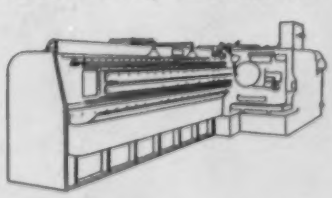
Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE



60" STROKE HORIZONTAL, ELECTRIC

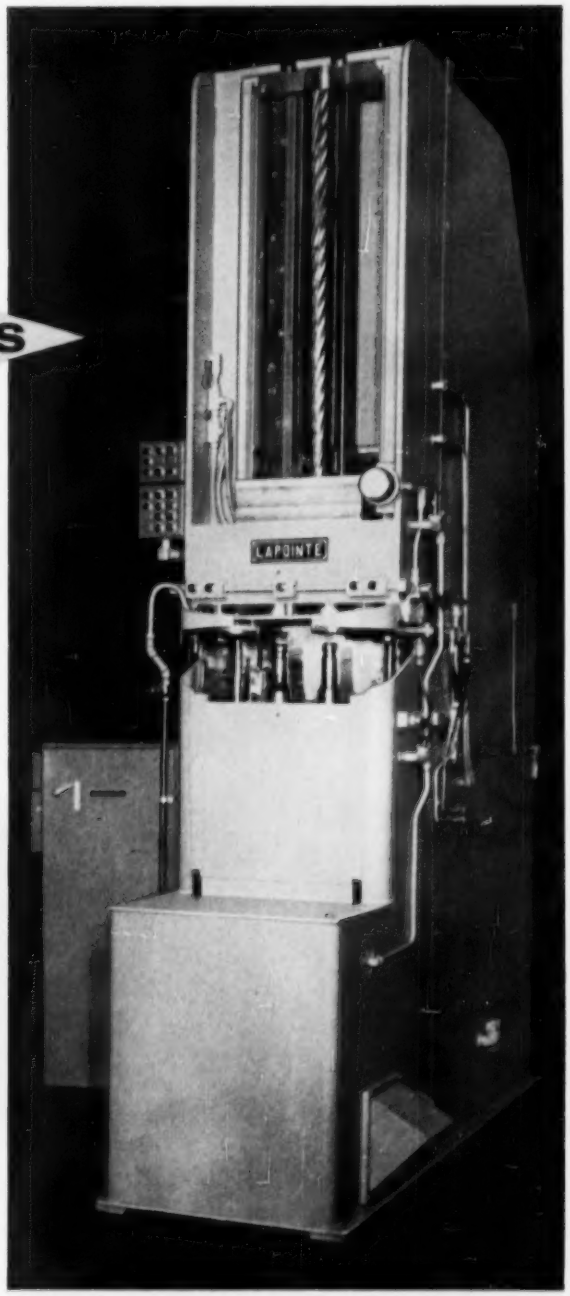


CH CONTINUOUS BROACHING, ELECTRIC



SRHE SINGLE RAM HORIZONTAL, ELECTRIC

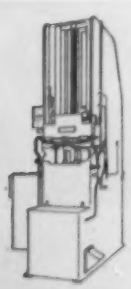
BROACHING MACHINES



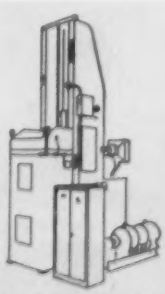
LAPOINTE accepts the responsibility for the *entire broaching program* in any plant: Lapointe builds the broaching machines, builds the broaching fixtures, and makes the broaches!

LAPOINTE VUE-7 with Electro-Motive Drive, set up for broaching helical internal gear automotive parts two at a time, at a rate of 320 parts per hour (at 80% efficiency). Built to broach at all practical speeds from 10 to 100 feet-per-minute.

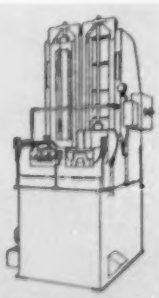
The Electro-Motive Drive is smooth and powerful. It is designed around a constant torque variable speed D. C. motor through a sturdy gear box. Gears are extremely rugged, built to withstand 100% momentary overload. The main drive gear is a continuous tooth herringbone type gear and rack.



VUE-7 VERTICAL PULL-UP ELECTRIC



SRVE SINGLE RAM VERTICAL, ELECTRIC



DRVE DOUBLE RAM VERTICAL, ELECTRIC

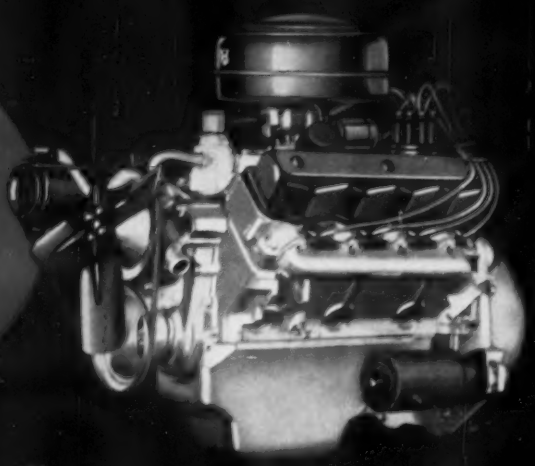
LAPOINTE

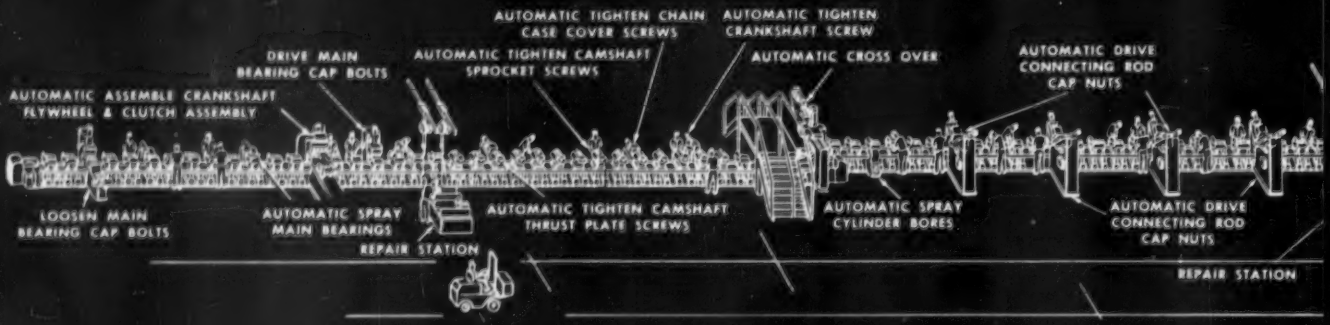
known to be the best in

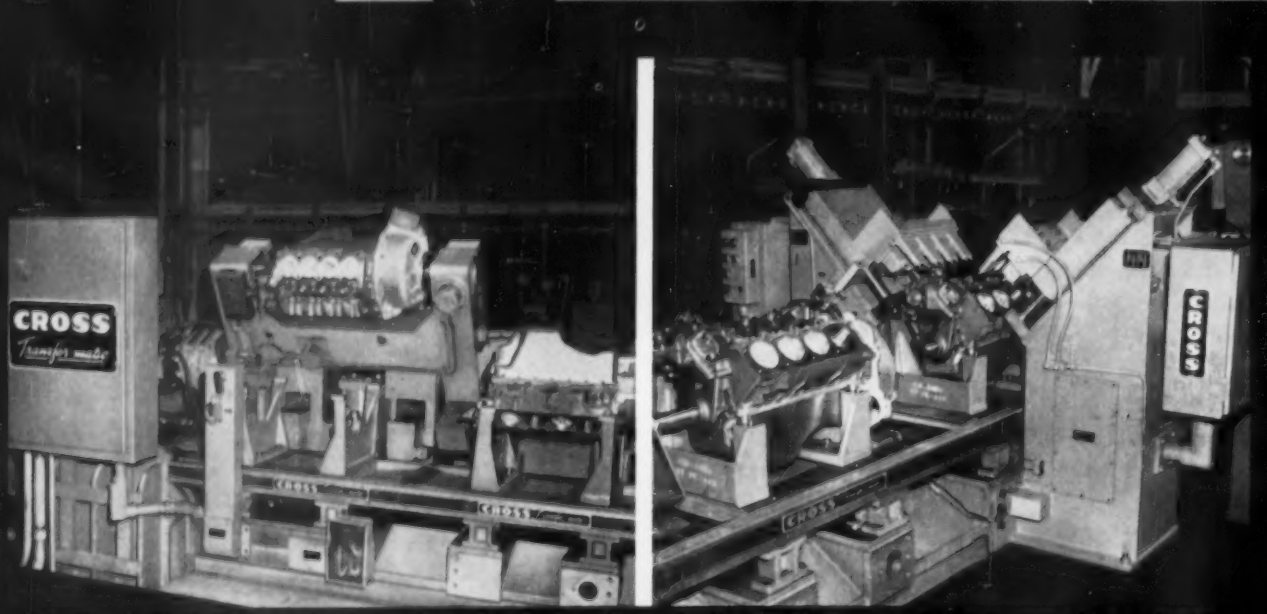
BROACHING

Another Automation First by Cross

Automation for Car Engine Assembly!



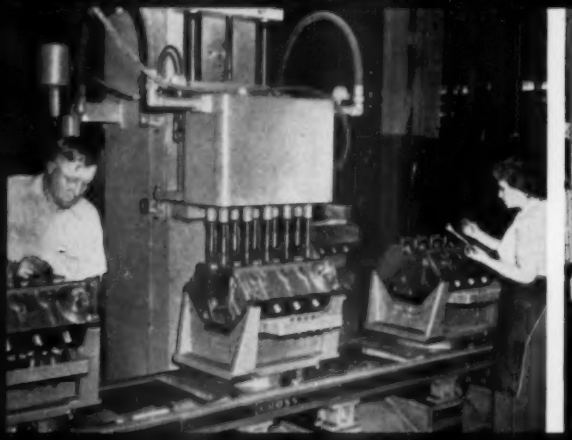

AUTOMATIC ASSEMBLE CRANKSHAFT FLYWHEEL & CLUTCH ASSEMBLY
DRIVE MAIN BEARING CAP BOLTS
AUTOMATIC TIGHTEN CAMSHAFT SPROCKET SCREWS
AUTOMATIC TIGHTEN CHAIN CASE COVER SCREWS
AUTOMATIC TIGHTEN CRANKSHAFT SCREW
AUTOMATIC CROSS OVER
AUTOMATIC DRIVE CONNECTING ROD CAP NUTS
LOOSEN MAIN BEARING CAP BOLTS
AUTOMATIC SPRAY MAIN BEARINGS
REPAIR STATION
AUTOMATIC TIGHTEN CAMSHAFT THRUST PLATE SCREWS
AUTOMATIC SPRAY CYLINDER BORES
AUTOMATIC DRIVE CONNECTING ROD CAP NUTS
REPAIR STATION



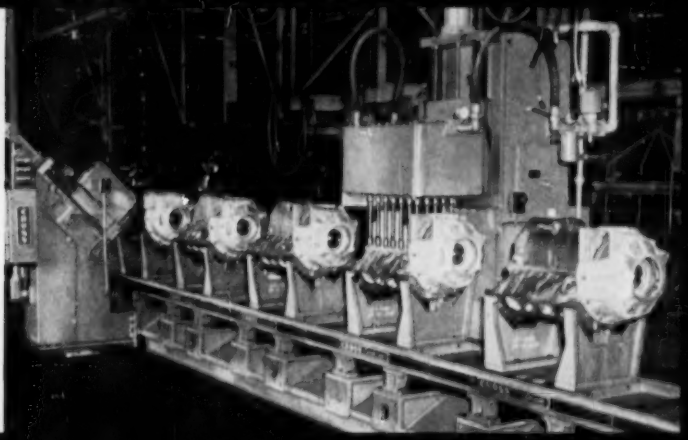
Section II, Station 44: engine is transferred to Section III, Station 1, and placed in car position.

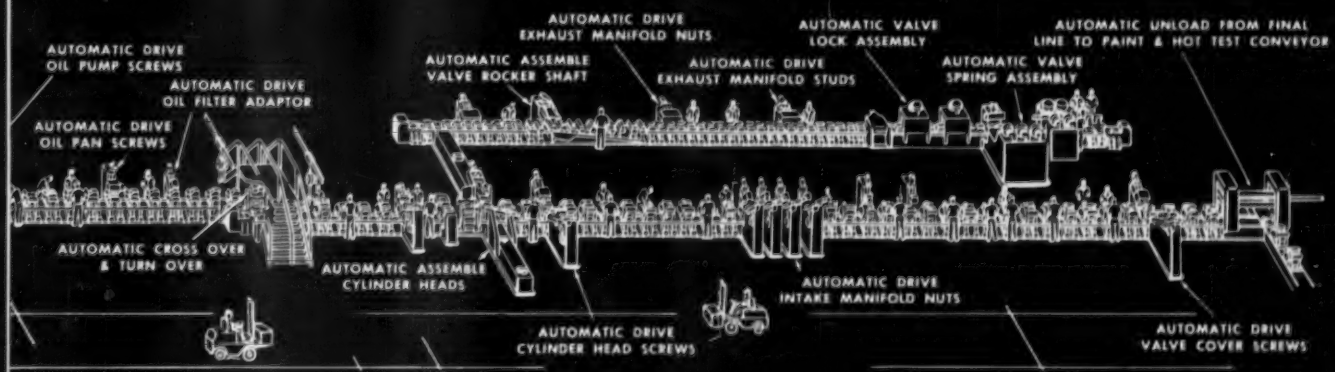
Section III, Station 3: oil is automatically applied to cylinders and valve lifter holes.

Section I, Station 3: bearing cap bolts are automatically loosened ready for crankshaft assembly.



Section II, Station 37: pan screws are automatically tightened, Station 40: oil filter adapter is assembled.




AUTOMATIC DRIVE OIL PUMP SCREWS
AUTOMATIC DRIVE OIL FILTER ADAPTOR
AUTOMATIC DRIVE OIL PAN SCREWS
AUTOMATIC CROSS OVER & TURN OVER
AUTOMATIC ASSEMBLE CYLINDER HEADS
AUTOMATIC DRIVE CYLINDER HEAD SCREWS
AUTOMATIC ASSEMBLE VALVE ROCKER SHAFT
AUTOMATIC DRIVE EXHAUST MANIFOLD NUTS
AUTOMATIC DRIVE EXHAUST MANIFOLD STUDS
AUTOMATIC DRIVE INTAKE MANIFOLD NUTS
AUTOMATIC VALVE LOCK ASSEMBLY
AUTOMATIC VALVE SPRING ASSEMBLY
AUTOMATIC UNLOAD FROM FINAL LINE TO PAINT & HOT TEST CONVEYOR
AUTOMATIC DRIVE VALVE COVER SCREWS

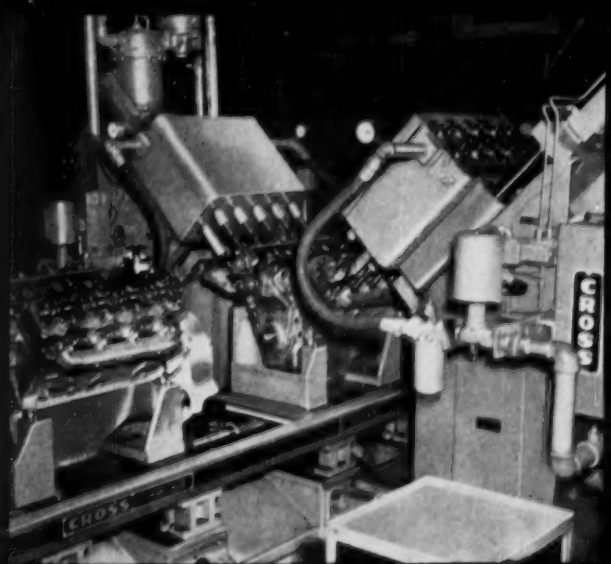
This production line for assembling V-8 car engines consists of three Transfer-matics with a total length of 812 feet. One assembles the engine; the other two (only one shown) assemble the cylinder heads. Operations start at three points with the block and head castings. They are automatically transferred through 198 stations as parts and sub-assemblies are added until the engine is completed and ready for testing.

The rated capacity is 150 engines per hour.

The engine assembly Transfer-matic is sectionized, a feature originated by Cross to reduce downtime. Three sections are provided to permit stopping some operations without interrupting the others.

Modular unit construction provides flexibility for engine changes and for adding new automatic assembly devices of the future.

Like other Cross machines, all parts—even tooling details—are made to interchangeable tolerances for fast, easy maintenance. Other features include construction to JIC standards and automatic lubrication.



Section III, Station 15: cylinder head bolts are tightened to a pre-determined torque.

Established 1898

THE CROSS CO.

First in Automation

DETROIT 7, MICHIGAN

The #914 Centerless Grinder will handle any bar or tubular stock from 1-in. to 6-in. diameter. The machine was built by the Production Machine Co., Greenfield, Mass.

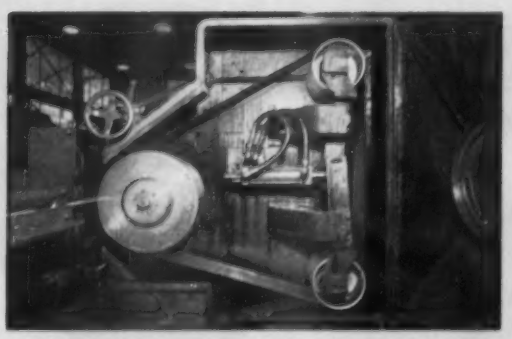
Revolutionary way to grind round stock... with the Production Machine Co. centerless grinder and Behr-Manning abrasive belts!

This modern grinding application, utilizing fast-cutting, long-lasting BEHR-MANNING Abrasive Belts, is proving industry's answer for increased stock removal production.

Two BEHR-MANNING Abrasive Belts are employed in this operation. A 9-in. wide grinding belt running over a 20-in. diameter steel contact wheel at 3,500 s.f.p.m. and a 9¾-in. wide regulating belt which revolves and feeds the workpiece across the grinding belt. This belt travels over a flat steel platen.

Whether you're grinding or finishing round stock, flat work, or intricate contours, check with your nearest BEHR-MANNING Application Clinic for the latest time-saving method. See your local BEHR-MANNING Representative, or write direct to Behr-Manning, Troy, N. Y., Dept. AM-4.

In Canada: Behr-Manning (Canada) Ltd., Brantford.
For Export: Norton Behr-Manning Overseas Inc., New Rochelle, N. Y., U. S. A.



Grinding belt and contact wheel housing with cover open. Note hydraulic belt tension device.

Abrasive belts plus the proper lubricants make possible stock removal rates previously unattainable.

G-3

BEHR-MANNING ®

BEHR-MANNING
division of NORTON Company

▲ COATED ABRASIVES
▲ SHARPENING STONES
▲ PRESSURE-SENSITIVE TAPES

A NEW PERSPECTIVE IN PRODUCTION

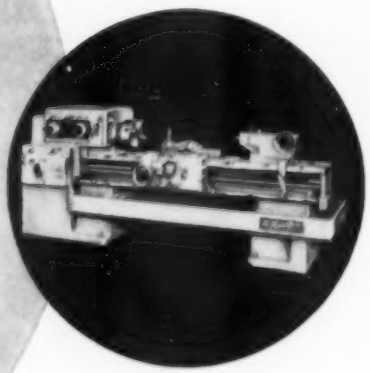
WITH LODGE & SHIPLEY *Powerturn* LATHES

It's time to take a new view of lathe economics. Whether the lathes in your plant are used for production or general purpose, you should be sure that they are producing as economically as possible. Lathes only a few years old may be liabilities from the standpoint of truly low cost production.

New Lodge & Shipley POWERTURN Lathes are designed in every way to facilitate turning to higher levels of profitable operation. Among many new features is the exclusive "Dial Your Speed" head. A dial is turned to the spindle speed required—colored pilot lights instantly indicate exact position for the speed change levers—thus eliminating operator error.

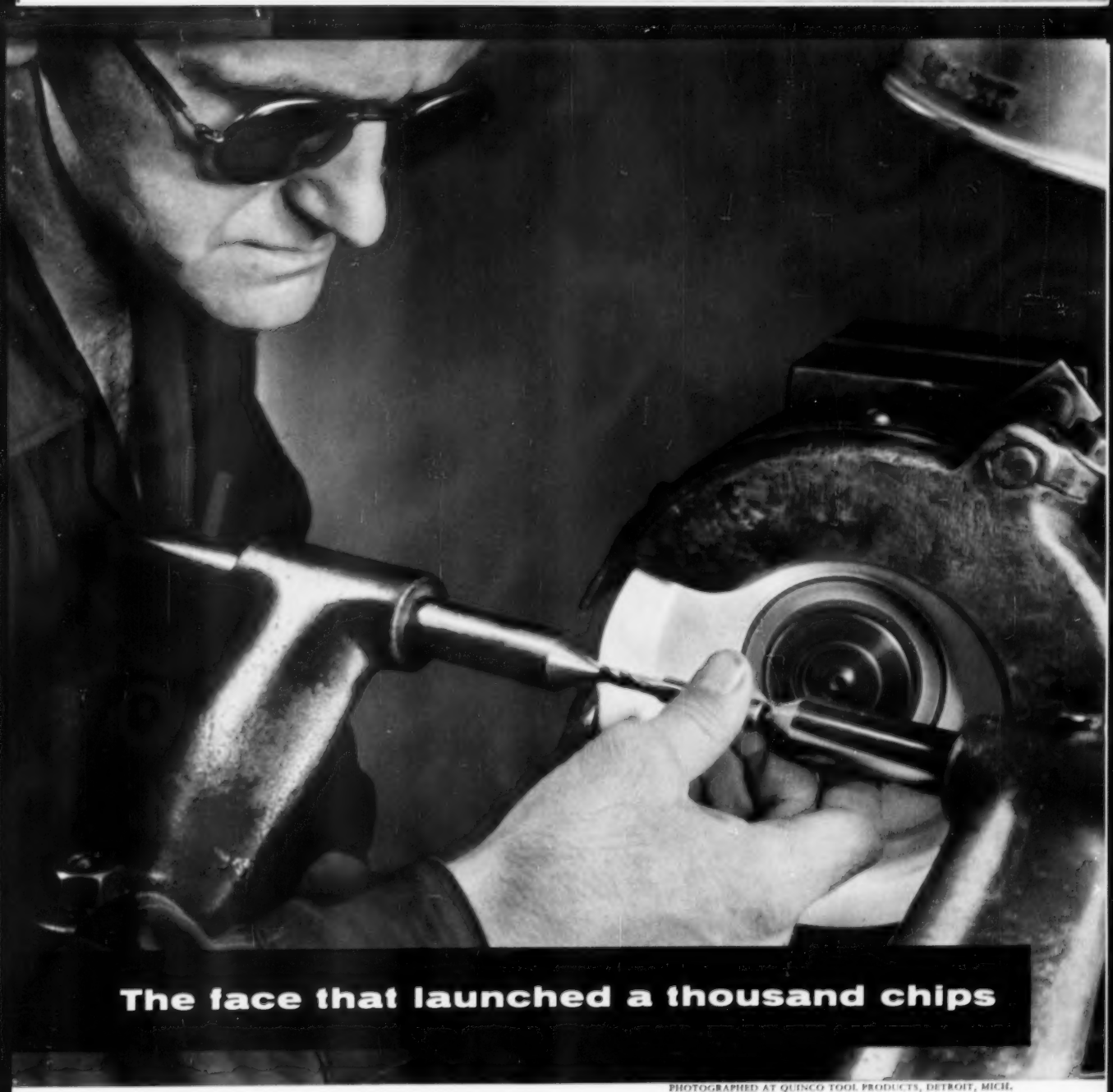
With all the new features, these Lathes offer traditional Lodge & Shipley rugged strength, power and accuracy. Get the facts now. "Up-date" lathe facilities for profitable production. Write for detailed literature: The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

16" POWERTURN Engine Lathe
(also manufactured in 13" and 20" Standard sizes, in Toolmaker, Gap, Manufacturing and 45° and 90° COPYMATIC models)



more than ever before . . .
your LODGE-*ical choice is*

Lodge & Shipley



The face that launched a thousand chips

PHOTOGRAPHED AT QUINCO TOOL PRODUCTS, DETROIT, MICH.

"Better finish—much cooler cutting—three times the production." This report on "V40" Bond Tool Room Wheels is typical of thousands received at CARBORUNDUM from tool rooms in every state of the union. Roughing end mills, finishing reamers, profiling multi-tooth cutters, backing off broaches, sharpening hobs...no matter what your job...*one* bond, "V40", will serve you better than any other. Wheel structure and bond combine to make "V40" wheels hold form and size longer than any other tool room wheels—cut costly down-time for dressing midway through a job. Yet the composition of the bond is such that "V40" wheels dress quickly and easily when necessary. Call your CARBORUNDUM Distributor or salesman for a trial, and see how easy "V40" wheels are to use . . . with profit! For performance reports on tool room grinding, write The Carborundum Co., Niagara Falls, N. Y. In Canada: Canadian Carborundum Co., Ltd., Niagara Falls, Ont.

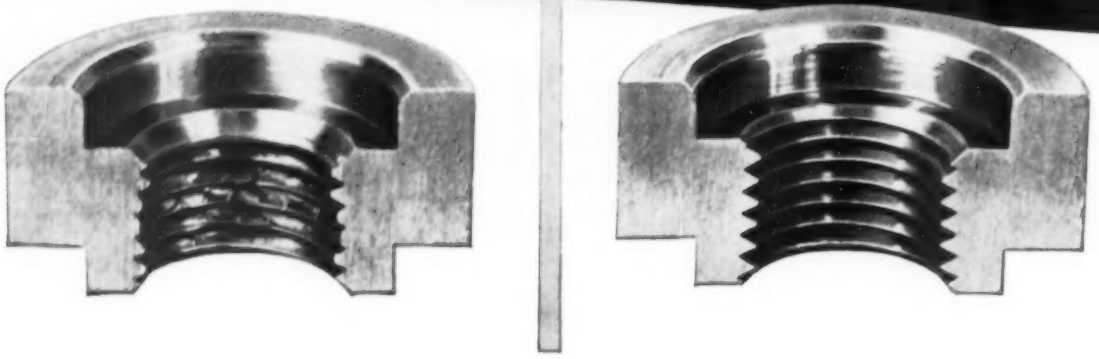
Through application "know-how" and product quality

CARBORUNDUM

REGISTERED TRADE MARK

continually puts more sense in your abrasive dollar

Why BALANCED CHEMICAL ACTIVITY in a cutting oil?



Left. Cupro-nickel bushing, cut in half to show internal threads, produced with a competitive straight oil.

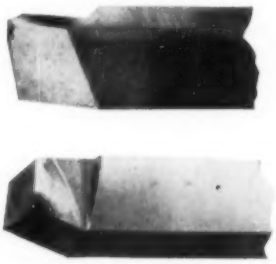
Right. Same type cupro-nickel bushing produced with Stuart's Thredkut X-18—providing controlled chemical activity.

The touch of a cutting oil with *balanced* chemical activity is easily recognized. It's the exceptionally smooth, satiny finish on part after part, even from soft, tough, stringy material . . . and increased tool life.

Stuart's Balanced Cutting Oils have controlled active sulphur and chlorine held in true chemical combination. Each oil is balanced to meet a specific range of job requirements from tapping, threading, gear shaping and gear hobbing to general purpose automatic screw machine work. Stuart oils with high sulphur activity are processed for the more difficult machining of soft, tough, stringy materials such as low carbon and stainless steels, monel metal and jet engine alloys. Oils with lower sulphur activity are designed for high speed machining of free-cutting materials such as B1112, B1113, leaded screw stocks, brass and aluminum alloys.

The "active" sulphur content of Stuart's Balanced Cutting Oils, as opposed to "lazy" sulphur, provides the anti-weld qualities that are so necessary to obtain smooth finishes. The active chlorine and fatty oil content provides the improved lubricity and temperature control to assure the best possible results in production.

Have "the Man in the Barrel", your Stuart Representative, assist you in selecting the right cutting oil for your job. Write for Stuart's Cutting and Grinding Fluid Selector and Dilut-O-Graph Folder, too. It's a quick guide to starting recommendations on any job.



Top: Abnormal front clearance wear of cutting tool caused by excessive sulphur activity of cutting fluid.

Bottom: Cratering of cutting tool caused by insufficient sulphur activity.

D. A. STUART OIL CO., LTD., 2729 S. Troy St., Chicago 23, Ill.

More than a "Coolant" is Needed

Stuart Oils

Plants in Chicago, Detroit, Cleveland, Hartford, and Toronto, Ontario.

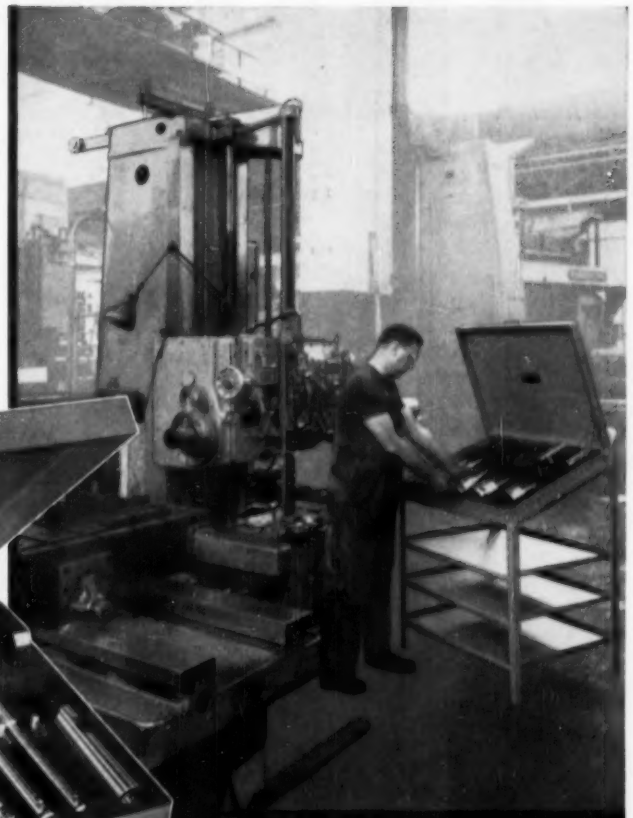
Branch Warehouses and Representatives in principal metal working centers in the United States, Canada and Europe.

Time Tested Cutting Fluids and Lubricants

do your operators have this

Time Saver

to help cut machining costs on stub boring operations?



SET No. 11 ILLUSTRATED
WEIGHT 350 POUNDS

SUPER MICROMETER-ADJUSTABLE STUB BORING TOOL SETS

- 1¼ to 8″ Bore Range in 7 Tools
- Eliminate "cut and try" boring
- Precision adjustment to .0001″
- Reduce setup and tool changes

Your operators always have the right tooling answer at their fingertips—for cutting costs and improving accuracy on non-repetitive boring—when you provide them with Davis Stub Boring Tool Sets. Then time lost at the tool crib is ended. For without once leaving their machines, they can bore from 1¼ to 8 inches, pencil bore from ⅜ to 1¼ inches and do light, extended boring up to 13 inches.

Highest precision and fine finish are assured by Davis Super Micrometer-Adjustable mechanisms used in all seven basic tools in each set. It provides a wide range of cutter adjustments to limits of .0001″ by simply setting the micrometer screw's dial head at the desired reading. Exceptionally rugged construction makes Davis tool sets ideal for either rough or finish boring operations. Learn how this modern tooling idea can save money in your shop.

Write today for Davis Bulletin DB-50.

10 DIFFERENT STANDARD SETS AND MANY MODIFICATIONS READILY AVAILABLE

DAVIS

BORING TOOL DIVISION OF
Giddings & Lewis Machine Tool Co.
Fond du Lac, Wisconsin

ARMSTRONG

T-SLOT CLAMP

SET-UP AND HOLD-DOWN TOOLS

STEP BLOCK

ARMSTRONG Set-up and Hold-down Tools reduce setting-up time—keep men and machines producing. Designed for use on planers, drill presses, milling machines, etc., they hold work securely and rigidly, and thereby reduce spoilage and prevent costly accidents.

Your local Armstrong Distributor carries ARMSTRONG Set-up and Hold-down Tools in stock in sizes for every operation. Stop haphazard setting-up methods. Provide each of your machines with a full complement of ARMSTRONG Set-up and Hold-down Tools.

NON-SKID JACKS

Write for Circular

Buy ARMSTRONG TOOLS from your Industrial Distributor

PLANER JACKS

UNIVERSAL CLAMP

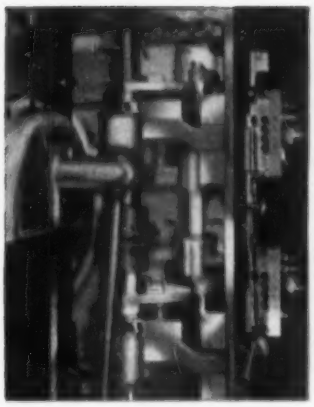
T-SLOT BOLTS AND NUTS

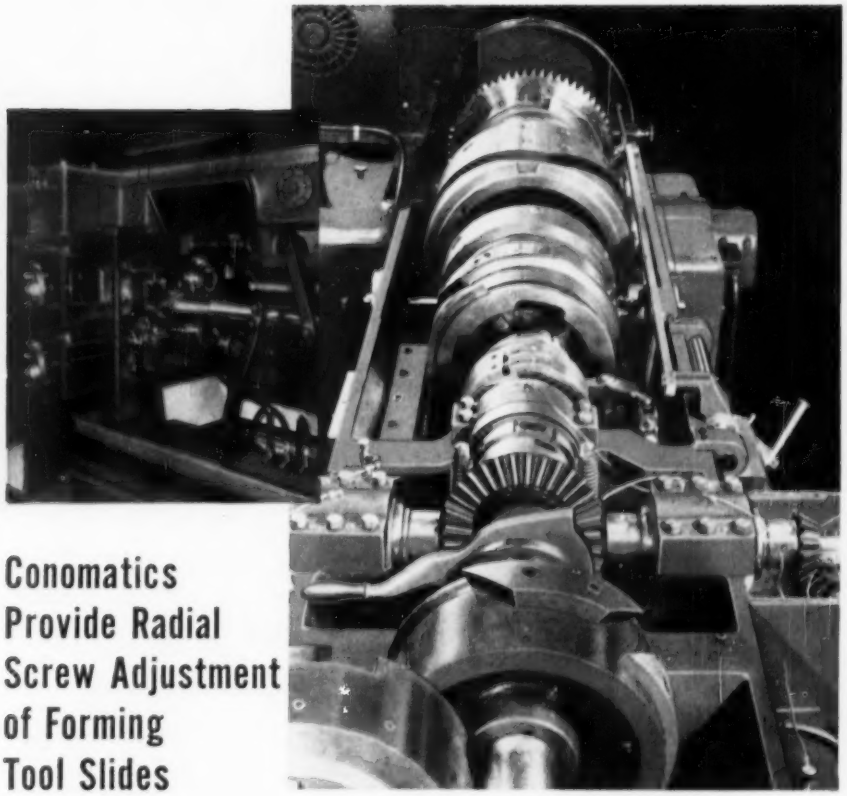
STRAP CLAMPS

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 W. ARMSTRONG AVE. CHICAGO 30, U. S. A.



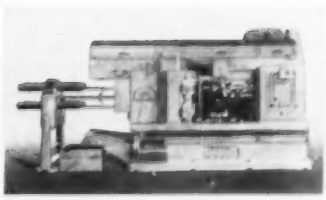


Conomatics Provide Radial Screw Adjustment of Forming Tool Slides

- Models 2⅝" LA, 3½" AD, 5" KL, and 5¼" KR Conomatic Four Spindle Bar Machines are equipped with a number of quick job-change features. One of these is the all-position end attachment drive for the mounting of endworking opposed spindles in all positions, with independent feed to as many as three opposed spindles on a single setup.

Another feature that is of considerable importance in tooling up is the radial screw adjustment of all sideworking slides. Trial cuts may be taken to correct diameters with form tools without changing the clamped positions of the form tool holders.

All Conomatic quick changeover models are equipped with dial adjustment of the working stroke of all tool carrying slides. Besides the Four Spindle machines there are three quick change Six Spindle models in 9/16", 1" and 1⅝" sizes.
Write, wire, or phone for literature.



Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U. S. A.

HEAT-SOURCE VENTILATION

PLUS values in power

in HOWELL series one hundred motors gives you

GREATER MOTOR DEPENDABILITY

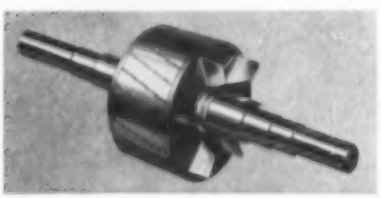
EXTRA INSURANCE AGAINST OVERHEATING

A faster, more efficient way to remove internal heat is a clear plus value for the man who buys motors. The cooler they run, the longer they last — and the more leeway there is to take intermittent overloading or excessively high air temperatures.

The laminations of Howell's new Series 100 Motors have unique, wide slots in their perimeters that carry the flow of fan-driven air right to the source of motor heat. There's 50% more contact between cooling air and the stator laminations than in conventional cores with smooth outer diameters.

Compare any or all of the new rerated motors with the Howell Series 100. Only then will you have facts to make the best buy!

GET THE PLUS values THAT COUNT....specify HOWELL series 100 motors

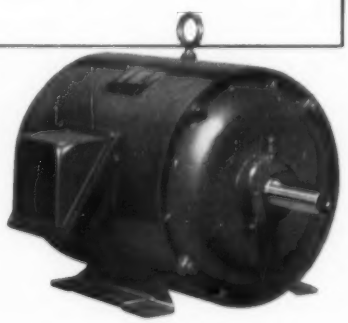


heat dissipating copper-clad rotors

Copper's faster heat conductivity (91% greater than aluminum's) reduces heat build-up in Series 100 motors. Copper rotors meet your special design requirements better, too.

Howellube greasing system checks over-lubricating

Grease enters and exits on same side of bearings — is never forced through to pack them tight. Results: longer bearing and motor life.



smaller, lighter, better looking

Save machine and storage space, save shipping weight, and get new functional streamlining that matches the motor to your most modern machine design or production equipment. Why put up with dust catching fins, when a sleek, good looking motor costs no more.

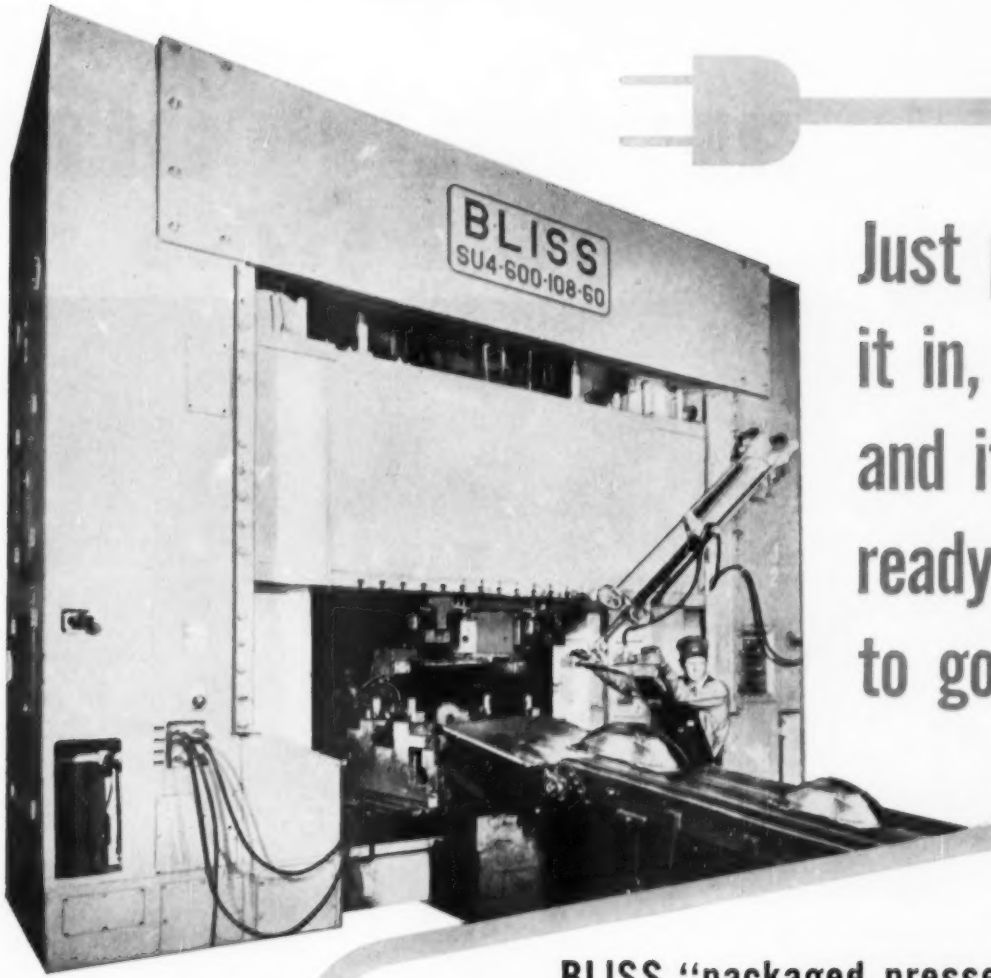
For more details on Series 100 motors, write for Bulletin N-100-R

HOWELL Red Band MOTORS

HOWELL MOTORS

PRECISION-BUILT MOTORS FOR INDUSTRY SINCE 1915

HOWELL ELECTRIC MOTORS COMPANY, HOWELL, MICHIGAN



Just plug it in, and it's ready to go!

NEW AUTOMATION CONTROL

This new nine-station rotary limit switch will control stops, starts, interlocks, motion, time, or recycles of auxiliary equipment. Each station can be set from 0° to 360°, can be operated either normally-open or normally-closed, and is accurate within less than 1°. Write for Bulletin 33.

BLISS "packaged presses" speed installation and simplify maintenance

Automation created the problem – The dopers, kickers, lifters and other materials handling devices so popular these days brought a maze of wires and pipes in their wake. And aside from looking untidy, they slowed maintenance and proved, annoying to crane operators.

"Packaging" solved it – Now, in Bliss' new line of presses, all the pipes and wires, and controls are built into the uprights. Each air and electrical line is tagged—simple to find, simple to fix. Controls are centrally located. The exterior is clean and uncluttered—cranes can move up close to change dies.

Bliss designers have come up with completely new two point and four point presses – both single action and multiple action. Design features include extremely rigid frames, eccentric drives, high speed clutches, extra long connections, motorized adjustments and many others. The entire line of presses is described in a comprehensive 32-page catalog, No. 11-B, just published. Copies for you and your staff are available by writing to E. W. Bliss Company

BLISS
SINCE 1857

is more than a name...it's a guarantee

E. W. BLISS COMPANY, Canton, Ohio

Presses, Rolling Mills, Rolls, Special Machinery

U. S. Plants in Canton, Cleveland, Salem and Toledo, Ohio; Detroit and Hastings, Michigan; Midland and Pittsburgh, Pa.; San Jose, Calif.; Branch Offices in Burbank, Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, San Jose, Salem, Toledo, Washington, D. C.; and Toronto, Ontario, Canada; E. W. Bliss (England) Ltd., Derby; E. W. Bliss Co. (Paris), France. Other representatives throughout the world.

REPUBLIC COLD

EXCELLENT MACHINABILITY of Republic's cold drawn steel helps Stanley Tools achieve uniform high quality in each Yankee Screw Driver spiral milled shaft. In addition, the cold drawing process produces marked improvement in the physical properties of any given analysis . . . including higher ultimate strength, yield point and hardness.

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

DRAWN STEEL

Backs "Yankee's" Ingenuity

Fine materials are an absolute must in the manufacture of the ingenious "Yankee" Spiral Ratchet Screw Driver. And that's why Republic Cold Drawn Steel is used for the heart of the unit, the precision, spiral milled shaft.

This is the part that bears the brunt of the operation . . . converting a push into a twist . . . making fastening jobs easier and quicker. It is vital in maintaining "Yankee's" world-wide reputation for dependable, trouble-free operation.

Years ago, Yankee Tools, Inc., now a division of Stanley Tools, selected Republic as their steel supplier for this critical application. Their decision was based on Republic's ability to furnish cold drawn bars of precise size and cross section, excellent physical properties and a high degree of machinability. The continuing success of the "Yankee" Spiral Driver is ample evidence of the wisdom of this choice.

Your Republic representative or Union Drawn Distributor is prepared to work with you in developing or improving your product using cold drawn steel bars or shafting. He can offer you a complete range of carbon, alloy and stainless analyses in all standard shapes and sizes. Or you can investigate the possibilities of securing major savings through the use of special sections. Contact him today. Mail the coupon for full information.

OTHER EXAMPLES OF THE RIGHT STEEL IN THE RIGHT PLACE INCLUDE...

TOUGH, DURABLE, PUMP PARTS shown here are made of Republic ENDURO® Stainless Steel, Type 416. Its free-machining properties permit cutting speeds up to 85% of standard Bessemer screw stock. In addition, it offers good corrosion-resistance, very high physical properties, and is hardenable. For full information, mail coupon today.

THIS BEARING RETAINER for a connecting rod assembly proved extremely difficult to machine. However, Republic metallurgists and machining specialists worked with the manufacturer to secure volume production using Republic Cold Drawn Alloy Bars. Their uniform machinability extended tool life and produced both the fine surface finish and strength required.

RATCHET DOGS for this wrench are simply short lengths cut from a Republic Cold Drawn Special Section. The result is a great saving in machining plus improved physical properties in the parts. Investigate the possibility of using special sections in your product. Your savings may be enormous. Send coupon for complete data.

STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
Dept. C-1196
3120 East 45th Street
Cleveland 27, Ohio

Please send me further information on the following Republic Union Cold Drawn Steels:

☐ Carbon ☐ ENDURO Stainless Steel
☐ Alloy ☐ Special Sections

Name_____

Company_____

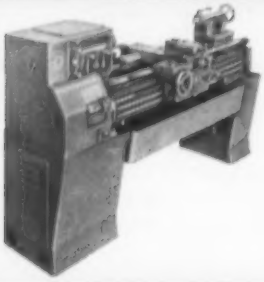
Address_____

City_____ Zone____ State_____

The Right Lathe for You from LeBlond's Complete Line...

Regal Lathes

Dependable Performance at Low Cost



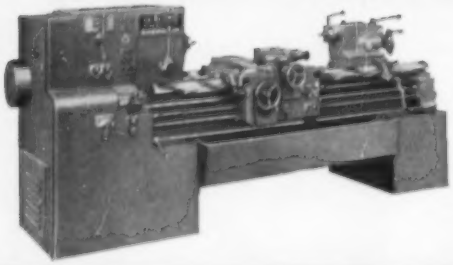
13", 15", 17", 19", 21", 24"; 2 to 5 horsepower

Designed and built like heavy-duty lathes, the new LeBlond Regals will give you a long life of precision production, minimum maintenance and the kind of dependability you'd expect from a much higher-priced machine!

Major features: Hardened and ground replaceable steel bed ways. Combination gear-belt drive headstock. *Both* feed rod and leadscrew. 3-bearing spindle. Advanced styling. Plus general construction details patterned after LeBlond heavy-duty lathes.

Small Heavy Duty Lathes

Stamina Plus with Precision



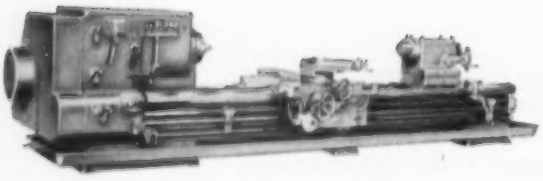
12", 14", 16", 20"; 7½ to 20 horsepower

LeBlond heavy-duty engine lathes have always been known for their outstanding stamina—the ability to stand up to the toughest turning jobs with precision, year after year. Our new machines in this class are the most rugged, yet precise that we've ever built!

Major features, 16" machine shown: Single-lever, four-way power rapid traverse built into the one-piece apron. Combination gear-belt drive headstock with 27 speeds from 16 to 2000 rpm. Totally-enclosed quick-change box. Hardened and ground replaceable steel bed ways. Automatic lubrication.

Large Heavy Duty Lathes

Heavy Hogging or Fine Finishing with Ease



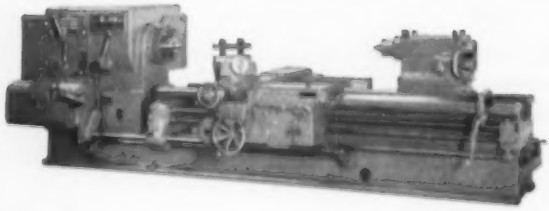
25", 32", 40", 50"; 50 and 60 horsepower

When large-swing work is in your production picture, check these big LeBlonds. Whether you need real high power, contoured shapes or fine finish, LeBlond offers the utmost in dependability, speed and easy operation.

Major features, 32" machine shown: Adjustable acceleration for starting, stopping, jogging provides true safety. 36-speed headstock, spur gear design for the lowest no-load friction horsepower. Four-way power rapid traverse (six-way on 40s or 50s). Generous proportions throughout for long-lived stamina and precision!

Sliding Bed Gap Lathes

Maximum Versatility with Dependability



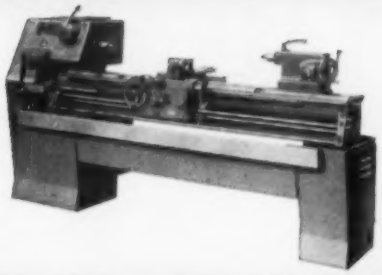
16"/38", 25"/50", 32"/60" Heavy Duties; 17"/28" Regal

Lathe department all rolled up in one machine! In addition to regular turning, facing, chasing, tracing, you can handle odd-shaped or large-diameter work as well as extra-long pieces.

Major features, 25"/50" machine shown: Sliding upper bed moves easily to provide variable gap or capacity for extra length. 36-speed high-power headstock. Special one-piece apron with extended length handwheel brings cutting tool close to gap. Four-way power rapid traverse.

Dual Drive Lathes

Best Buy for Medium-duty Turning



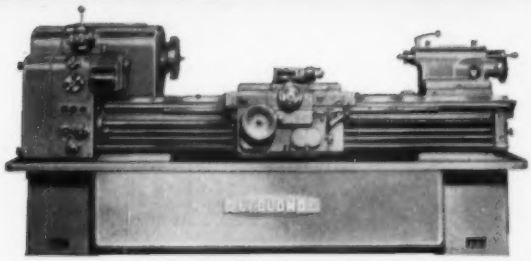
15"; 5 horsepower

Dual Drive gives you efficient capacity for the great proportion of your lathe work. Smooth and powerful spindle speeds satisfy all requirements up to those requiring a heavy-duty machine. Precision production at moderate cost!

Major features: Single-lever choice of 16 spindle speeds from 31 to 2400 rpm through combination gear-belt drive headstock. Hardened and ground replaceable steel bed ways. Totally-enclosed quick-change box. Automatic lubrication. Double-wall, one-piece apron.

Model RT Toolroom Lathes

The Ultimate in Precision, Convenience, Versatility



16"; 7½ horsepower

Even today, other lathes can't match the advanced designs pioneered by LeBlond in the RT Toolroom Lathe. When it comes to producing a wide variety of fine toolroom work, no other lathe can match the convenience, precision and speed of the RT.

Major features: Infinitely-variable spindle speeds from 6 to 1500 rpm by a single lever. Universal quick-change box provides 90 feeds and threads. Four-way power rapid traverse. Combined feed apron cuts steep tapers. Automatic chasing stop limits cross slide travel, saves time in chasing threads.

Rapid Production Lathes

Best for Low-cost High Production

13", 17", 21"; 3 to 10 horsepower

Not a stripped down engine lathe, RP is designed to give you high production for a variety of work within a range you choose. A great number of productive attachments are available to suit your special needs.

Major features, 13" machine shown: Choose from three headstocks that give you speeds as low as 68 rpm and as high as 3600 rpm. Hardened and ground replaceable steel bed ways. Automatic lubrication to headstock and feed box. Heavy-duty carriage and apron.

LeBLOND also Builds:

Plain Bed Gap Lathes.....12", 14", 16", 20", 25", 32"

Hollow Spindle Lathes.....16", 20", 27", 30"

Toolroom Lathes.....12", 14", 16", 20"

Standard Duty Lathes.....20", 25", 32", 40"

Crankshaft Lathes.....Automatic—for any crank

Cutter Grinder

Hydra-Trace*
Duplicating Attachment...Fits most LeBlonds built since 1935

*Trade Mark Reg. U. S. Pat. Off.

LeBLOND of Cincinnati

Write for complete catalog C-56A

The R. K. LeBlond Machine Tool Company *Cincinnati 8, Ohio*

World's largest builder of a complete line of lathes for more than 69 years

Representatives in principal cities throughout the world

STAYNEW FILTERS

Dollinger makes ALL TYPES of filters as shown on this page, plus special filters for unusual filtration problems. New users of one specific type of Staynew filters often find a second Dollinger filter performs a great, added service in other processes or operations. Perhaps we can serve major or other filtration needs of your plant.

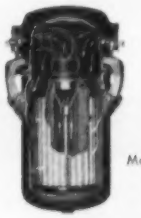
LIQUID FILTERS

Model HE (Sump) Liquid Filter Bulletin 330

Model ELS (Pressure) Liquid Filter Bulletin 300

PIPE LINE FILTERS

Model CPH Pipe Line Filter Bulletin 200



Model CVH (Vacuum) Pipe Line Filter Bulletin 200

Model AAPHS (Absorption) Pipe Line Filter Bulletin 200

Model HPH and AHPH (High Pressure) Pipe Line Filter Bulletin 200

all types of FILTERS for every INDUSTRIAL NEED

AIR INTAKE FILTERS

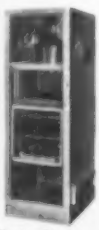
Model IDR (Ground Level) Air Intake Filter Bulletin 100

Model DS (Silencer) Air Intake Filter Bulletin 100

Model D (Outdoor) Air Intake Filter Bulletin 100

Model C (Indoor) Air Intake Filter Bulletin 100

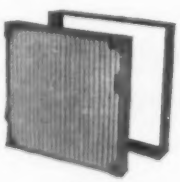
VENTILATION FILTERS



Electro-Staynew Mist Collector Bulletin 420

Electro-Staynew Precipitator Bulletin 400

Automatic Ventilation Filter Bulletin 500



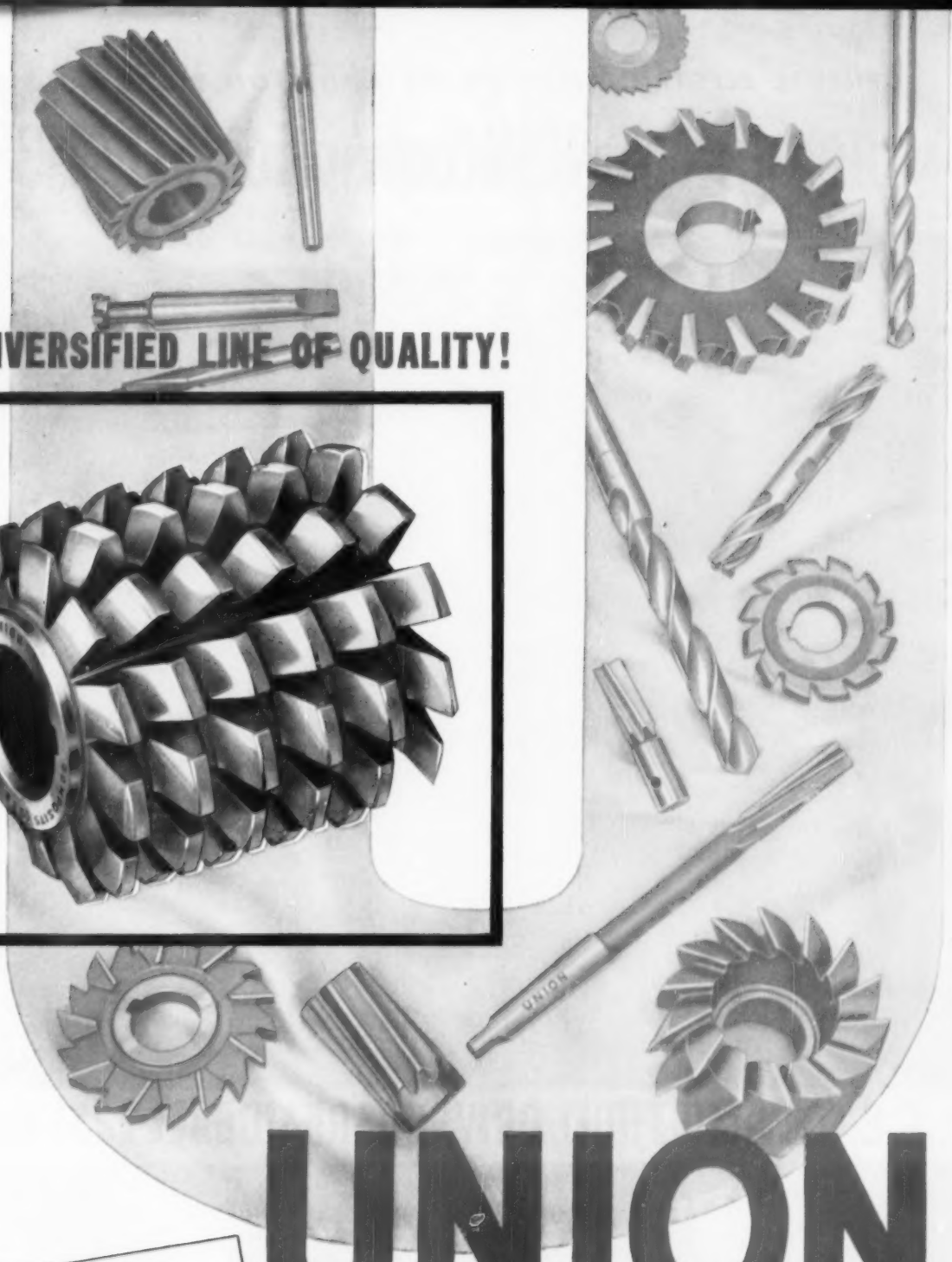
Dry and Viscous Panel Ventilation Filters Bulletin 600 and 700

DOLLINGER PROTECTOMOTOR STAYNEW FILTERS

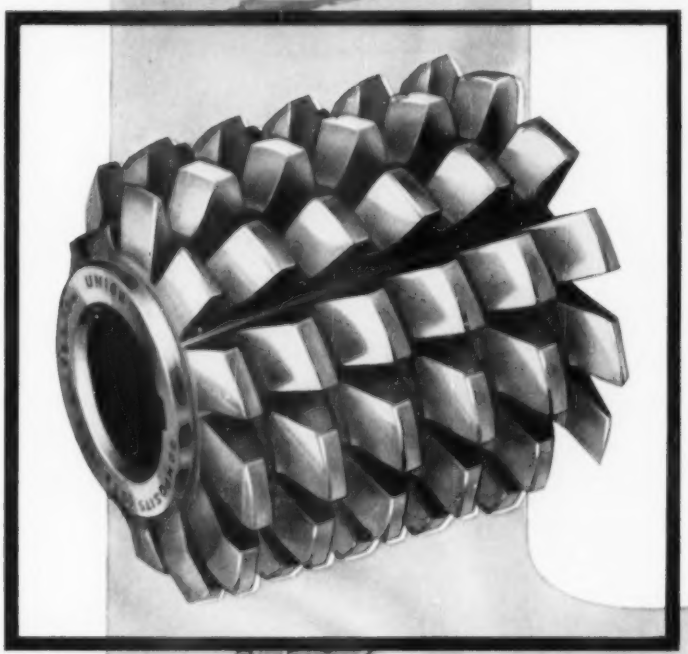
DOLLINGER CORPORATION CENTRE PK ROCHESTER 3 N Y

Write, using Bulletin Numbers, for complete information on any of the Staynew filters illustrated. Consult Dollinger engineers on any special filtration problems—no obligation. Dept. 9, Centre Park, Rochester.

LIQUID FILTERS, PIPELINE FILTERS, INTAKE FILTERS, HYDRAULIC FILTERS, ELECTROSTATIC FILTERS, DRY PANEL FILTERS, VISCOUS PANEL FILTERS, LOW PRESSURE FILTERS, HIGH PRESSURE FILTERS, AUTOMATIC VENTILATION FILTERS, NATURAL GAS FILTERS, SPECIAL DESIGN FILTERS, SILENCER FILTERS



A DIVERSIFIED LINE OF QUALITY!



UNION

Call Your
UNION DISTRIBUTOR
for
Prompt, Dependable Service

There's a UNION HOB ready to do the job for you, accurately and economically. UNION offers a complete selection of top quality hobs, standard and special, to suit the requirements of your job.

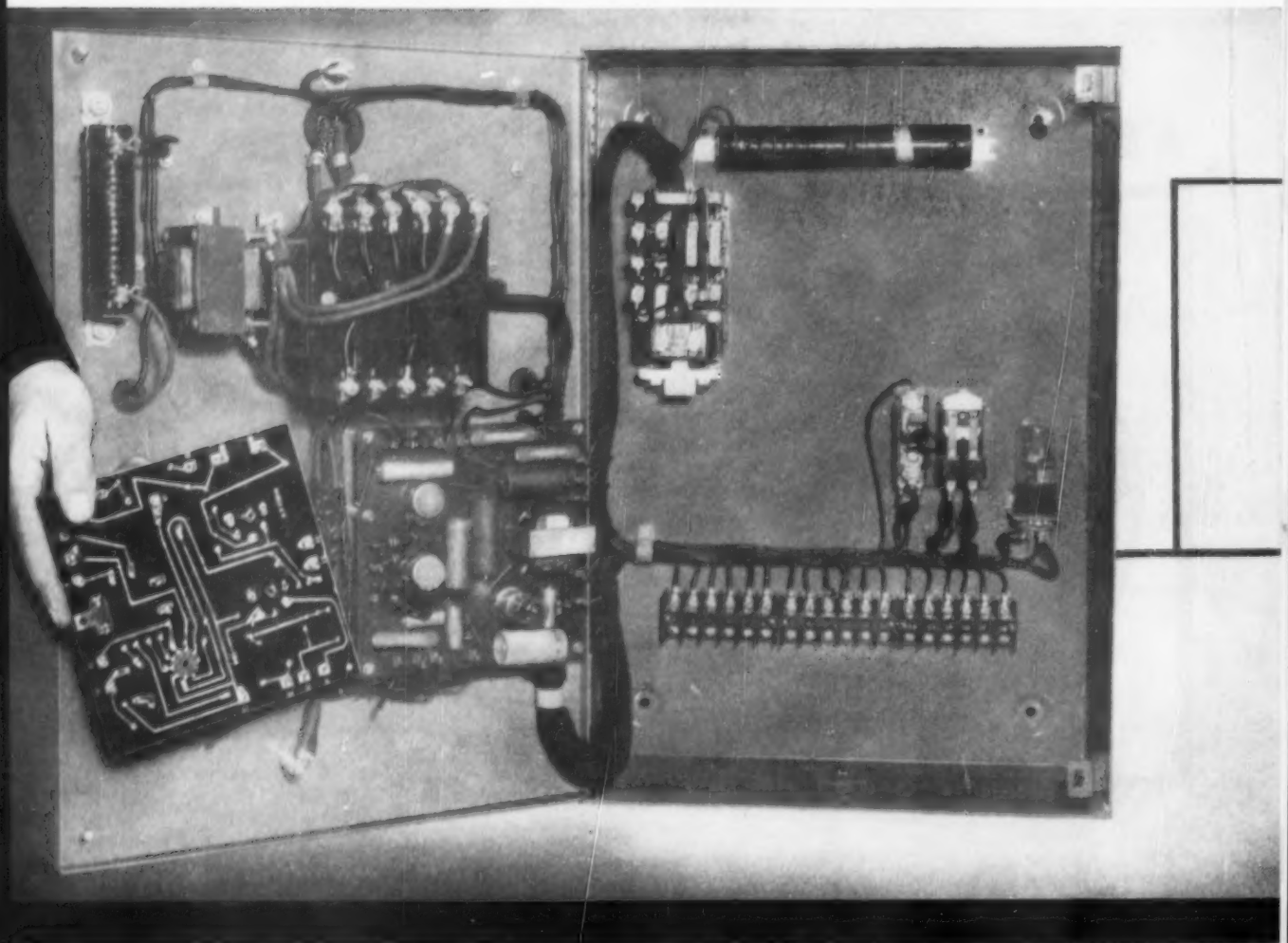
UNION TWIST DRILL COMPANY

ATHOL • MASSACHUSETTS

Owners and Operators of: **S. W. CARD CO. DIVISION, Mansfield, Mass.**
BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Que.

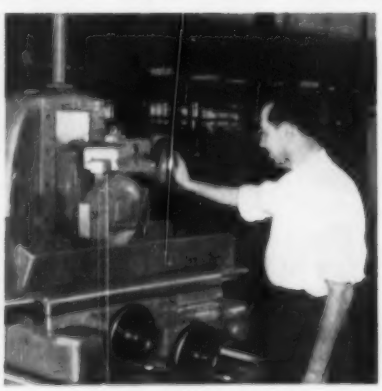
GENERAL ELECTRIC ANNOUNCES ADDITION TO THY-MO-TROL*

NEW Low-priced 3/4-3 HP

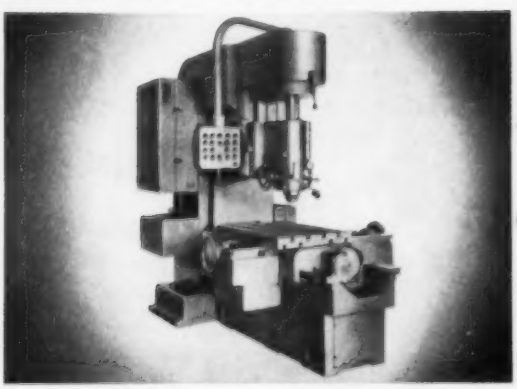


G-E THY-MO-TROL DRIVES ARE IDEALLY SUITED

Electronic Induction Heater. Thy-mo-trol Drive moves the carriage to exact pre-set conditions to assure uniform heat treatment.



Surface Grinder. All motions on this grinding machine are controlled by General Electric's Thy-mo-trol Drive: spindle, table and cross-feed operations.

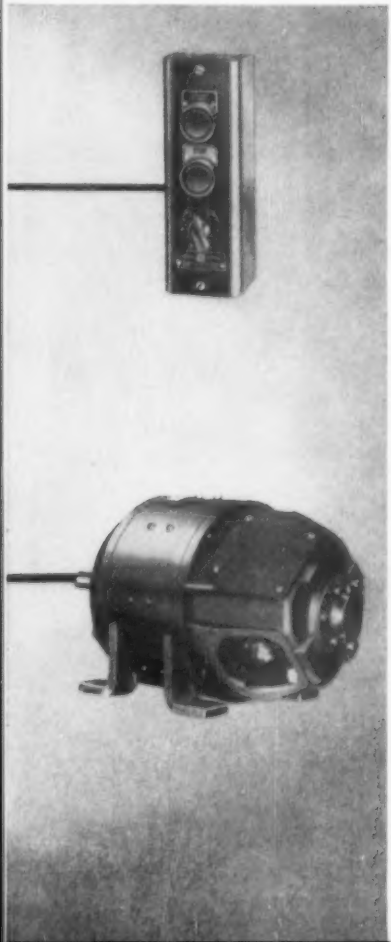


Milling Machine. Thy-mo-trol Drives automatically step up production on this milling machine by giving correct speeds for spindle, table and spindle head drive requirements.

BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Que.

DRIVE LINE . . .

Thy-Mo-Trol Drive with Printed Circuitry



NOW! FOR MACHINE TOOL APPLICATIONS —A RELIABLE, SIMPLIFIED, ADJUSTABLE SPEED DRIVE

These new, simplified General Purpose, 3/4-3 HP Thy-mo-trol Drives have been developed for industrial applications demanding wide speed range and close speed regulation. Embodying all the smooth adjustable speed characteristics of DC drives, the two models offer greater performance, reliable operation and wide speed range selection for many industrial applications.

A PRICE REDUCTION, due largely to G.E.'s industrial application of printed circuitry has been made. The entire control system has been simplified, giving the user substantial reductions in over-all weight, size, circuit complexity, amount of wiring, maintenance costs and installation costs.

OPERATING DIRECTLY FROM AC POWER, the new Thy-mo-trol Drives can increase machine production on most applications because they • Give the correct speed for the required operation • Reduce operating spoilage and rejects because of high accuracy performance and • Increase machine versatility because of the wide speed range and close speed regulation features offered.

THE COMPLETE THY-MO-TROL DRIVE LINE COVERS ratings from 1/40 to 30 HP and beyond. Speed ranges of 5:1, 20:1, 50:1, and 100:1 are typical. Speed regulation of $\frac{1}{2}$ of 1% is possible over the entire speed range.

SIMPLIFIED FRACTIONAL HORSEPOWER THY-MO-TROL DRIVES are supplied as half-wave or full-wave units, allowing a wide selection of performance standards to meet each particular industrial application.

HIGH PERFORMANCE INTEGRAL HP THY-MO-TROL DRIVES, 3/4-30 HP, full-wave offer these superior performance features: greater flexibility, rugged industrial-type construction, easy maintenance, wide speed range, adjustable current limit, flat speed regulation and optional features such as: jogging, quick slowdown, reversing, dynamic braking, tachometer feedback and position synchronization all add up to qualify these drives for many machine tool and industrial applications.

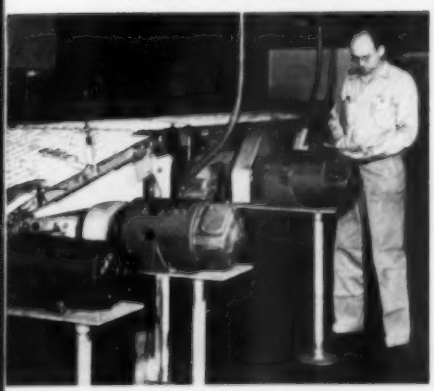
FOR MORE INFORMATION on General Electric's Thy-mo-trol electronic adjustable speed drives, contact your nearest G-E Apparatus Sales Office or write for Bulletins GEA-6234, GEA-4089, GEA-5179, GEA-5827 and GEA-5337—General Electric Company, Schenectady, N. Y. 791-2

Progress Is Our Most Important Product

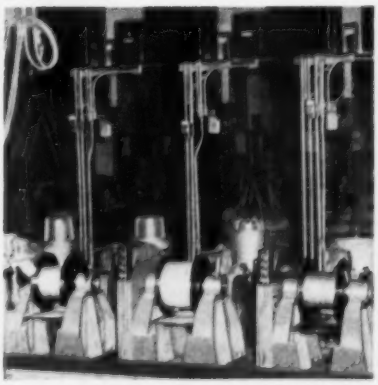
GENERAL ELECTRIC

* Reg. Trade-mark of General Electric Company.

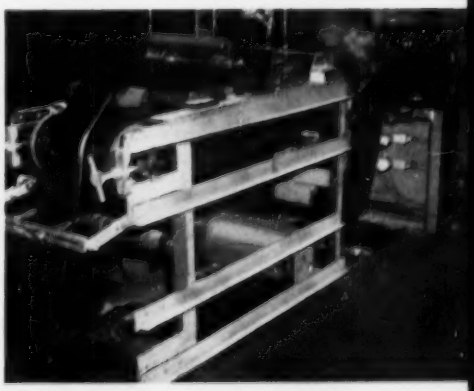
TO THESE TYPICAL INDUSTRIAL APPLICATIONS



Cookie Conveyor. Repeated variations in speed—necessary to meet baking requirements—are easily handled by Thy-mo-trol Drive.



Wire Re-Winder. As the coil of wire builds up, Thy-mo-trol Drive continually adjusts speed of reel to maintain constant winding at maximum speed.



Tire-Treading Machine. A continuous strip of tire-tread passes from extruder (in background) to conveyor. Thy-mo-trol Drive synchronizes the operation.

FRINGECOUNT*

MICROMETER

New measurement concept brings speed... laboratory precision to inspection operations

The greatest advance in measurement standards today, the FRINGECOUNT micrometer is accurate to 0.000001". Designed for the measurement of gage blocks, plug gages, other external standards and small close tolerance parts, the FRINGECOUNT brings increased accuracy and time-savings to your inspection and quality control departments.

The extreme accuracy of the Model 212 FRINGECOUNT micrometer is possible because it refers to the wave length of light rather than man made references. Push button controls provide ease of operation . . . clear, easy to read measurement is presented on a digital counter. Extremely stable, the Model 212 eliminates the need for time consuming rechecks and gage block references. Repeated measurements can be made without time-out for new set-ups.

For complete information write to Dept. AM today for Bulletin LP-3521.

*Trade Mark of Link Aviation.

INTERFEROMETER . . . high stability of the mechanical and optical system assures extreme acuracy —up to 0.000001" —throughout the FRINGECOUNT's 0 to 2" range.

COUNTER . . . EASY TO READ COUNTER gives instantaneous digital presentation of light fringes which are directly interpretable into a dimension.

CONTROL UNIT . . . push button controls provide bi-directional operation of the motor driven head and zero setting of the instrument.

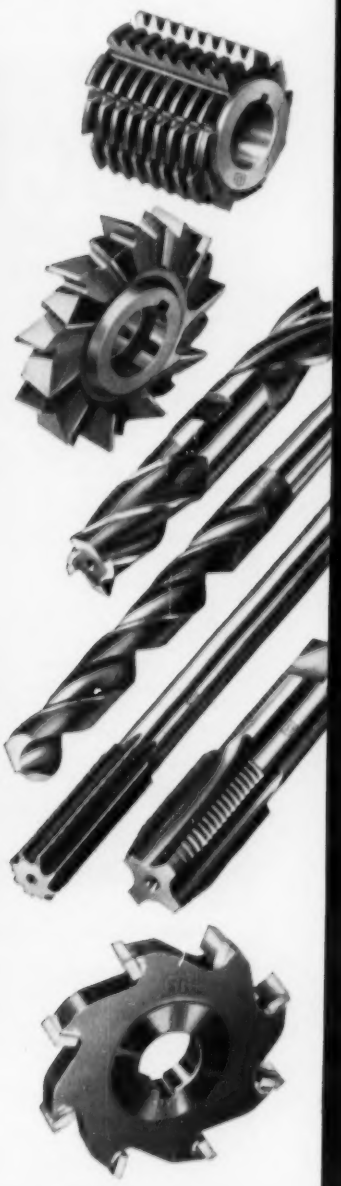
Pioneer and World's Largest Producer of Jet Flight Simulators

A SUBSIDIARY OF GENERAL PRECISION EQUIPMENT CORP.

LINK AVIATION, INC.

BINGHAMTON, NEW YORK

Standardize with STANDARD



YOUR STANDARD TOOL DISTRIBUTOR STOCKS THE COMPLETE LINE

SERVING INDUSTRY 75 YEARS 1861-1936

●When you're faced with a cutting tool problem, the STANDARD TOOL MAN—backed by 75 years of industrial experience—will recommend a practical, profitable solution.

Your Standard Tool Man is familiar with all types of metal-cutting operations and is always at your service without obligation.

Call him!

STANDARD TOOL CO.

3950 CHESTER AVENUE CLEVELAND 14, OHIO

STANDARD TOOL CO.

FACTORY BRANCHES IN: NEW YORK • DETROIT • CHICAGO • DALLAS • SAN FRANCISCO

THE STANDARD LINE: *Twist Drills · Reamers · Taps · Dies · Milling Cutters · End Mills · Hobs · Counterbores · Carbide-Tipped Tools · Gages*

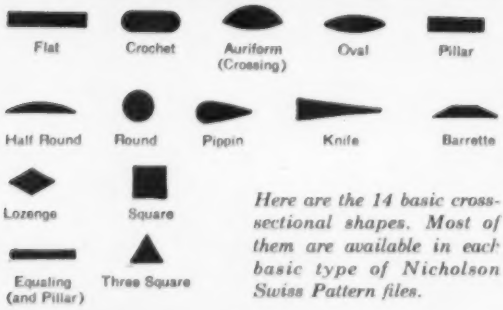
PRECISION FILES FOR PRECISION WORK...

THE STORY OF TRADE X.F. MARK TRADE X.F. MARK

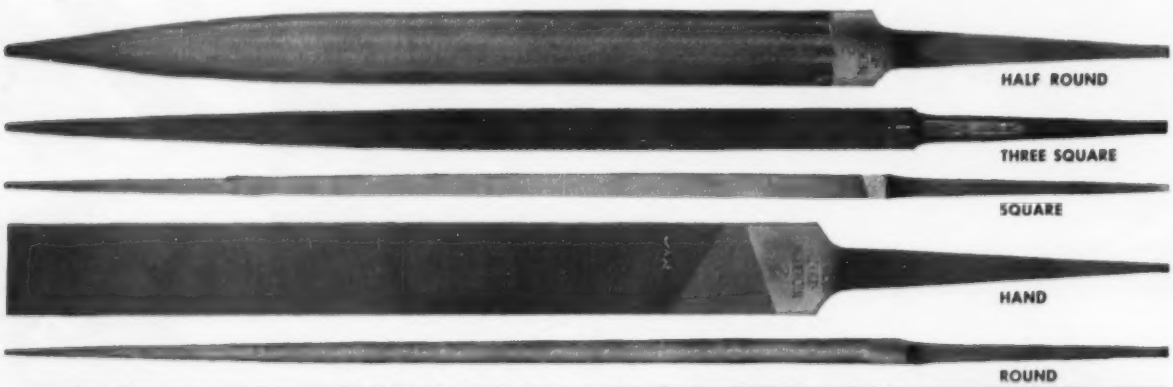
NICHOLSON X.F. SWISS PATTERN FILES

There are hundreds of types and sizes in the Nicholson's Swiss Pattern "family." You'll find Nicholson X.F. (*EX*tra *F*ine) files especially developed for precision work and fine finishing in your shop—everything from jewelry through die making to aircraft.

Nicholson Swiss Pattern files are made to extremely exacting standards. Many of these files have the same general shapes as American Pattern files, but are thinner and more finely shaped. They come in a greater variety of shapes and sizes, and are available in *six* degrees of fineness, instead of the three found in conventional American Pattern files.



Here are the 14 basic cross-sectional shapes. Most of them are available in each basic type of Nicholson Swiss Pattern files.



Above are representative files from the most popular group of Nicholson Swiss Patterns. Others include Knife, Round Straight, Metal Saw, Pillar, Equaling, Pippin, Ring, Warding, Barrette, Slitting and Crossing.

Another important group is Round (knurled) Handle Swiss Patterns. These are available in most of the basic cross sections, either individually or boxed in assortments of one dozen.

Nicholson also manufactures Special Purpose Swiss Patterns of the following types: Parallel Machine files, Special Tension Machine files, Round Bench Machine files, Square Handle Needle files, Die Sinkers and Silversmiths Rifflers. These files are available in most of the basic cross sections.

This is the simplified story of Nicholson Swiss Pattern files. Your Industrial Salesman will gladly tell you more about how Nicholson Swiss Patterns can increase filing efficiency in your shop.

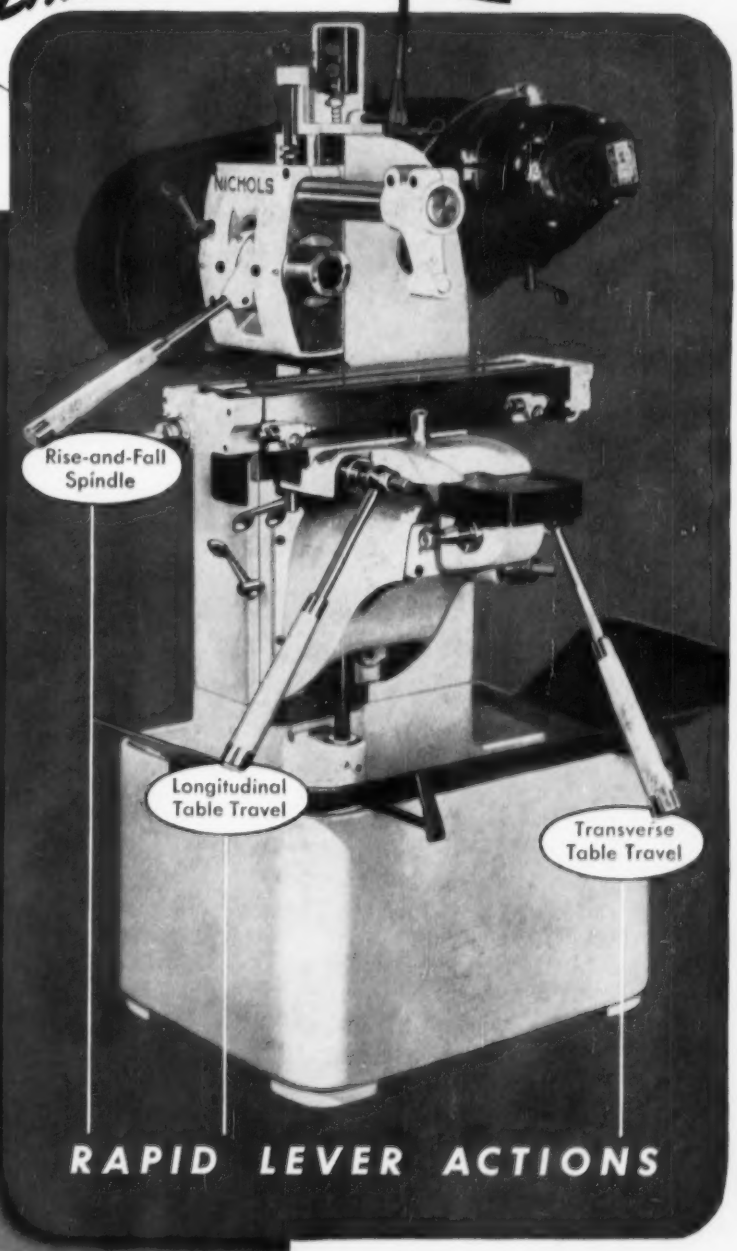
Write for free book: "FILE FILOSOPHY"

NICHOLSON FILE COMPANY, PROVIDENCE, RHODE ISLAND
(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

NICHOLSON FILES

A FILE FOR EVERY PURPOSE

LATHE CARRIAGE FLEXIBILITY



Nichols Miller

PRODUCTION MODEL

Precision turning, boring and recessing jobs that are normally assigned to toolmaker's lathes or expensive boring machines, come natural to the versatile NICHOLS Millers.

Rapid Lever Actions on the Spindle Head, Table, and Saddle provide unparalleled flexibility of movements. The Lever Transverse Feed, an exclusive NICHOLS development, is especially valuable. Makes NICHOLS different from other hand millers. It adds *"lathe-carriage flexibility"* to your most intricate machining operations, while maintaining tolerances to "tenths." Work can be chucked lathe-fashion on the spindle with tools mounted on the table or vice versa.

Adjustable positive stops, quick-acting locks on sliding movements, and the highest degree of precision are standard equipment.

"THE MILLER THAT USES ITS HEAD"

Send for free illustrated brochure.

MANUFACTURED BY W. H. NICHOLS COMPANY, WALTHAM, MASSACHUSETTS

NATIONAL DISTRIBUTORS

NICHOLS-MORRIS CORPORATION

76-F Mamaroneck Ave., White Plains, N. Y.

CONDENSED SPECIFICATIONS

Table Working Surface	6¼" x 21"
Longitudinal Table Travel	10"
Transverse Table Travel	7"
Vertical Travel of Knee	13"
Rise and Fall of Spindle	4½"
Selective Speed Ranges up to	5000 R.P.M.
Weight	1250 lbs.

GENERAL ELECTRIC ANNOUNCES...
NEW Industrial
GENERAL ELECTRIC
DIRECT CURRENT MOTOR

Direct-current Motor

KINAMATIC* a new standard in direct-current motors, gives your machines wider speed ranges, greater output

To meet modern industrial needs for faster, more automatic, more continuous production, General Electric has designed an entirely new direct-current motor—the d-c Kinamatic.

Designed for Automation—Now, a direct-current motor has been designed for the modern job it has to do—either as individual motor drive or in regulating systems. The new General Electric d-c Kinamatic motor supplies the wide speed range and versatility required for today's manufacturing methods. It is designed for the close control of machines and split-second timing of processes essential to higher output.

Accelerated Production—The new d-c Kinamatic motor will modernize your equipment, give it increased power, higher speeds, greater output capacity. With the quick-acting G-E Kinamatic motor, your machines will process a greater variety of products . . . faster . . . easier . . . and with less maintenance and spoilage.

More Powerful—By combining advanced design with improved materials and manufacturing techniques, General Electric engineers have packed more power into the entire Kinamatic line. The powerful Kinamatic motor, with new stamina and durability, is ready to become one of your most effective weapons for keeping costs down, for meeting competition, for boosting productivity levels.

Engineering Help—Industrial specialists in 149 conveniently located General Electric Apparatus Sales Offices have the complete story on how the new d-c Kinamatic motors and generators can benefit your operation. For full details, contact your G-E Sales Representative, or write for Bulletin GEA-6355. *Direct Current Motor and Generator Department, General Electric Company, Erie, Pennsylvania.* 8151

* Trade Mark of the General Electric Company

Progress Is Our Most Important Product

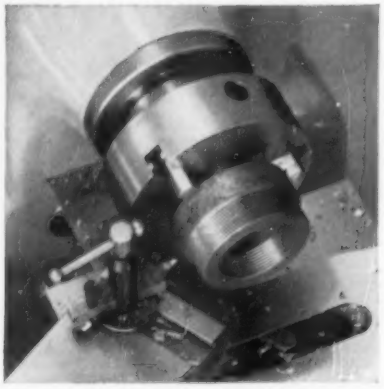
GENERAL ELECTRIC

HARDINGE
ELMIRA, N.Y.

"The Outstanding Tool Room Lathe"

Precision Collet work for all sizes to 1-1/16" Collet seats *directly* in spindle.

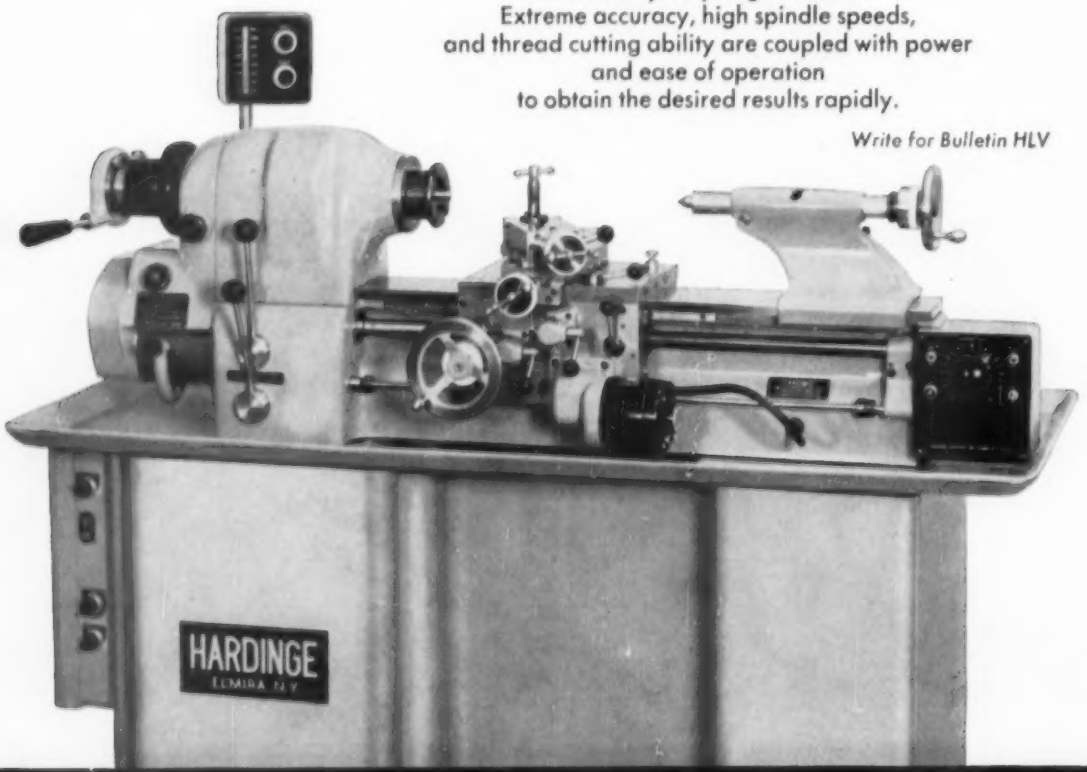
Precision Step Chucks for diameters up to 6". Provides Collet-like accuracy.



Integral Mount Jaw Chucks for precision holding of regular or irregular shapes up to 5".

Hardinge Model HLV 10" Lathe was primarily designed to fill a very old existent gap between the plain precision bench lathe and the heavy duty engine lathe.
Extreme accuracy, high spindle speeds, and thread cutting ability are coupled with power and ease of operation to obtain the desired results rapidly.

Write for Bulletin HLV



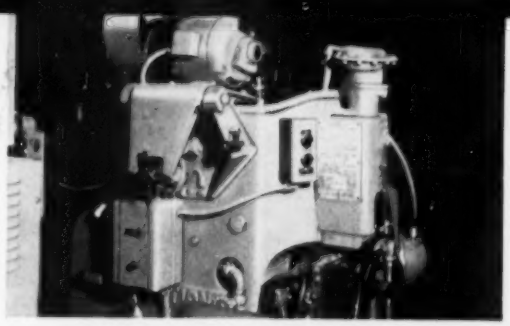
HARDINGE BROTHERS, INC., ELMIRA, N. Y.

Offices In Principal Cities. Export Office: 269 Lafayette St., N. Y. 12, N. Y.

Where to use
3 KINDS OF G-E MAGNETIC STARTERS
and why . . .

NON-REVERSING STARTERS—for all full-voltage, single-speed motor applications

When remote control is desired, or when motors are started and stopped frequently—such as on machine tools, compressors, blowers, or similar equipment—use G-E magnetic starters. The strongbox coil is layer-wound with insulated wire, and impregnated with a solventless varnish. The windings are enclosed in a molded case which keeps out moisture and oil, and helps protect against accidental damage.



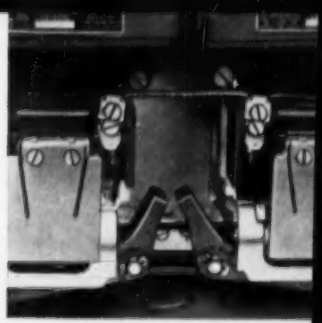
NON-REVERSING STARTER ON WELDER

STRONGBOX COIL

REVERSING STARTERS—for control of motors which rotate in both directions

To control motors which reverse direction—on hoists, door openers, and planers, for example—select G-E reversing starters. They consist of two separate starters in a single case, with an interference-type mechanical interlock which prevents short circuits caused by one starter closing before the other starter opens the circuit. Extra electrical interlocks are also available.

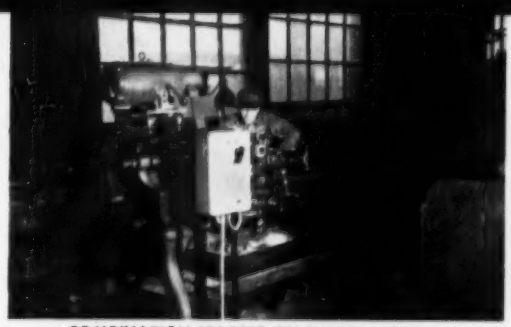
REVERSING STARTER ON OVERHEAD DOORS



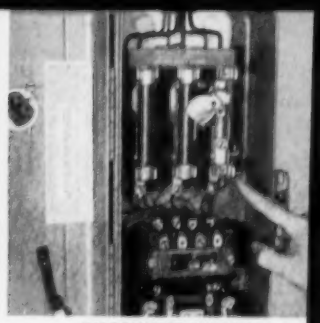
MECHANICAL INTERLOCK

COMBINATION STARTERS—for starter and short-circuit protection in one unit

G-E combination starters—which come in both reversing and non-reversing forms—have the extra feature of a fusible, or non-fusible disconnect switch, or circuit breaker for short-circuit protection and manually disconnecting the motor from the line. Interchangeable fuse clips provide maximum flexibility, enable you to adapt your starter to new circuit conditions. 733-5



COMBINATION STARTER ON TURRET LATHE



DISCONNECT SWITCH

FOR ANY APPLICATION—specify General Electric for best quality, most reliability

For further information write for bulletin GEC-1260, or contact your nearest General Electric Apparatus Sales Office or Distributor.

GENERAL ELECTRIC

BLOOMINGTON, ILLINOIS

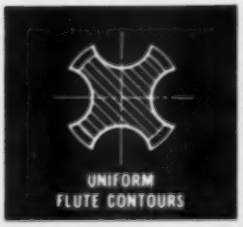
WINTER

BALANCED ACTION
PERFORMANCE IN TAPS

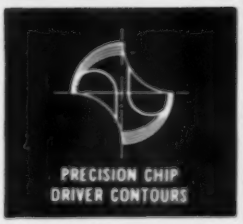
comes from great care and skill in their manufacture. It assures you accuracy and long tool life. Only WINTER makes Balanced Action Taps.

Plug and Ring Gages:
A complete line.

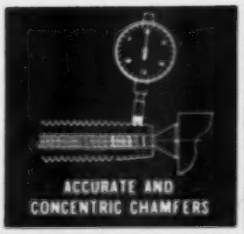
EXACT FLUTE SPACING



UNIFORM
FLUTE CONTOURS



PRECISION CHIP
DRIVER CONTOURS

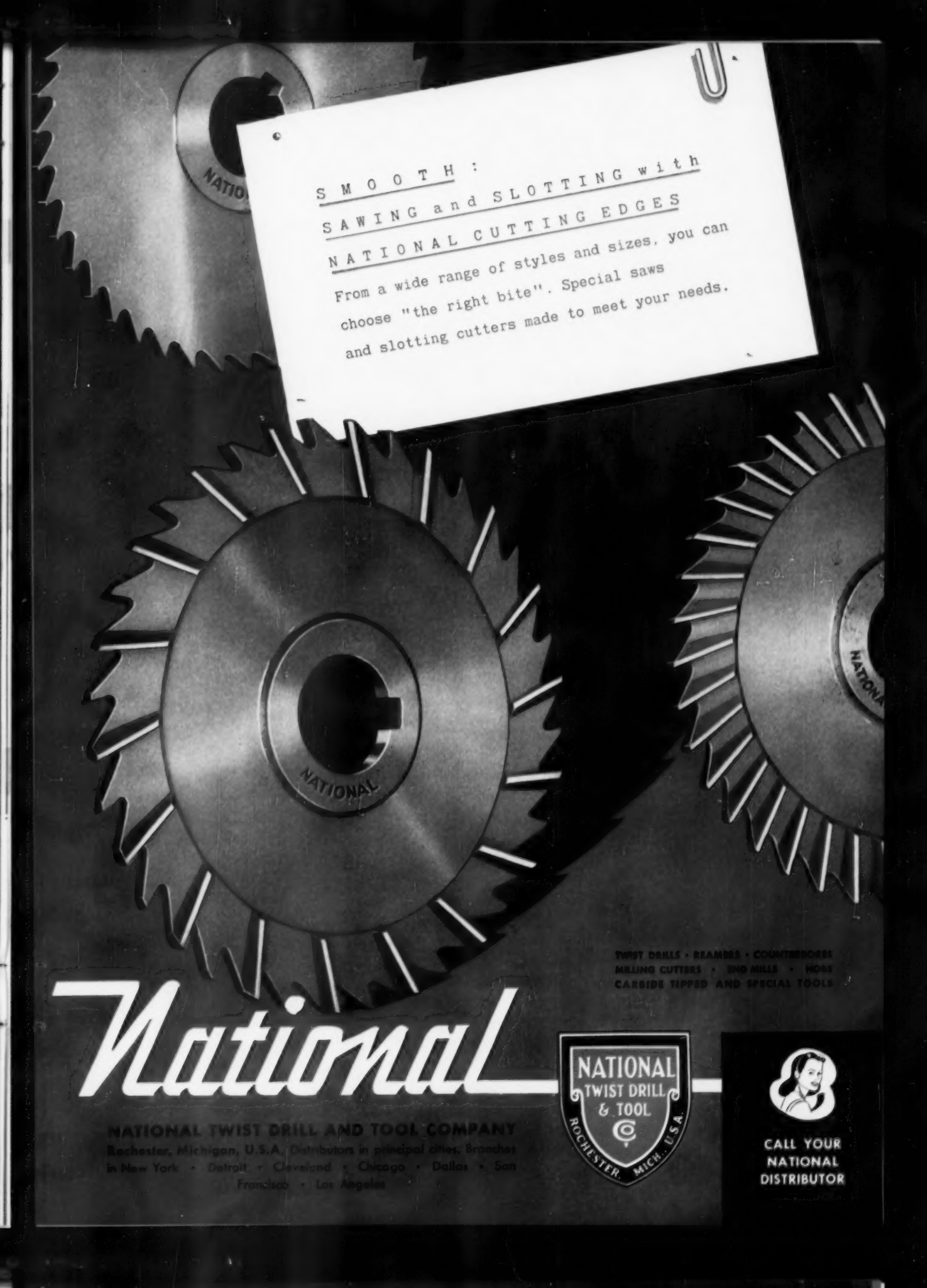


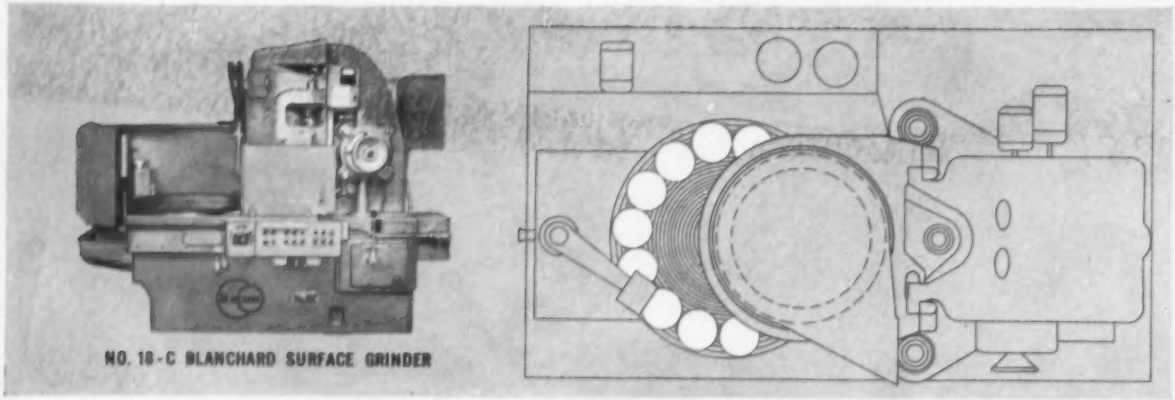
ACCURATE AND
CONCENTRIC CHAMFERS

CALL YOUR
WINTER
DISTRIBUTOR

WINTER BROTHERS COMPANY

Rochester, Michigan, U.S.A., Distributors in principal cities. Branches in New York • Detroit • Cleveland • Chicago • Dallas • San Francisco • Los Angeles • Division of National Twist Drill and Tool Co.

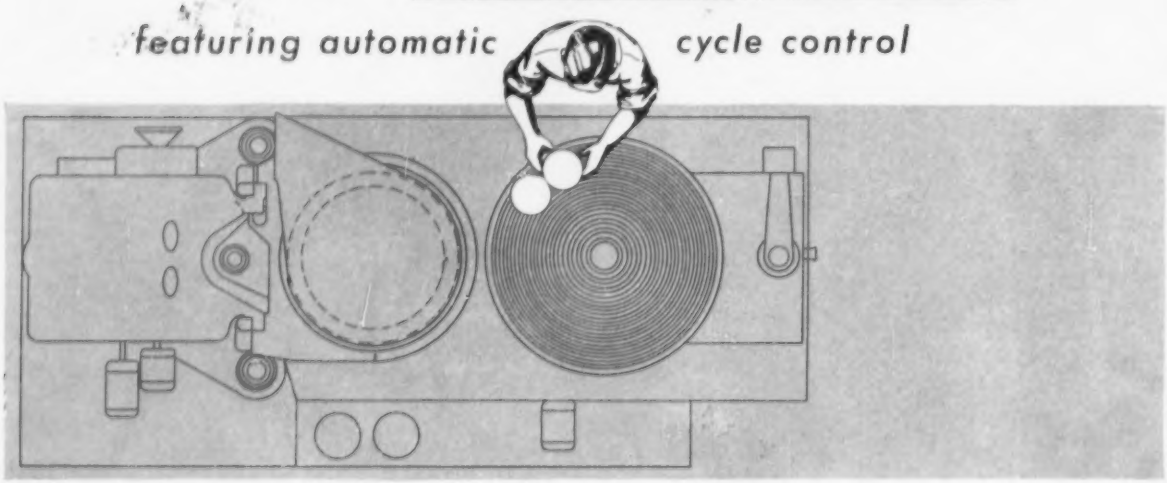

SMOOTH:
SAWING and SLOTTING with
NATIONAL CUTTING EDGES
From a wide range of styles and sizes, you can choose "the right bite". Special saws and slotting cutters made to meet your needs.
NATIONAL
TWIST DRILLS • REAMERS • COUNTERBORES
MILLING CUTTERS • END MILLS • HOBS
CARBIDE TIPPED AND SPECIAL TOOLS
National
NATIONAL TWIST DRILL AND TOOL COMPANY
Rochester, Michigan, U.S.A. Distributors in principal cities. Branches in New York • Detroit • Cleveland • Chicago • Dallas • San Francisco • Los Angeles
NATIONAL TWIST DRILL & TOOL
ROCHESTER, MICH., U.S.A.
CALL YOUR NATIONAL DISTRIBUTOR



NO. 18-C BLANCHARD SURFACE GRINDER

Plan for more profitable production with this new Blanchard Grinder

featuring automatic cycle control



This great new Blanchard has the speed and simplicity which guarantee economical grinding on a wide variety of jobs.

One operator can easily operate two of these automatic cycling surface grinders. By using the automatic cycle, he can unload, clean and reload one grinder while the other grinds automatically.

The automatic cycle does everything else: moves chuck (30" or 36" dia.) to grinding position and starts it rotating; starts wheel rotation and coolant pump; provides rapid wheel approach to work; engages power down-feed at preset rate; changes to fine feed just before finished size is reached; stops feed when work is to size — "sparks" out; raises wheel head; stops wheel, coolant pump and chuck; moves chuck to loading position—demagnetizes chuck.

The No. 18-C also features: push button selection of manual or automatic operation; automatic size control; simple feed and head traverse controls; adjustable dwell timer.

This new Blanchard offers you many new production advantages. Look into them today — write for free catalog showing work done on the No. 18-C.

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

BUTTERFIELD

The Butterfield tools you buy more than meet the quality control standards set for your product.

- **Long Cutting Mileage**
- **Smoother Finishes**
- **Guaranteed Top Performance**

Use Your Local Butterfield Distributor To Your Advantage.

You get lower inventory costs, expert counsel and "hurry-up" service.

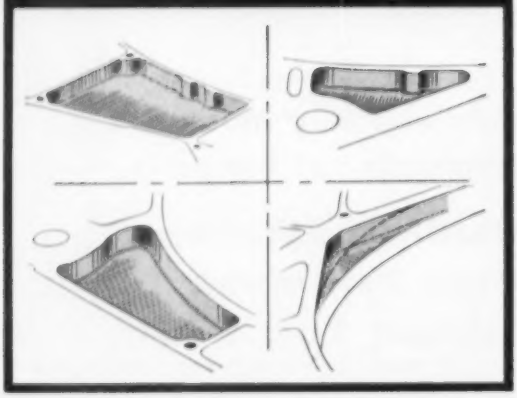
UNION TWIST DRILL COMPANY

BUTTERFIELD DIVISION

DERBY LINE, VERMONT, U. S. A.

Typical Cuts

Illustrated below are only a few of the many detail cuts that can be taken on bulkheads, wing spars, caps, etc.

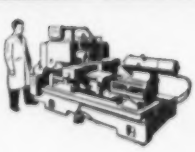


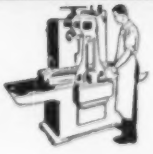
. . . SUNDSTRAND 3 DIMENSION TRACER MILLING UNIT

Here's a new milling unit designed for taking numerous small irregularly shaped cuts on large work pieces. The unit is self contained and can easily be moved to many different cutting positions around a large work part. If desired, several units can be mounted to a simple sub-base to provide a multi-station machine. As the cutter moves rather than the work piece itself, less floor

SUNDSTRAND "Engineered Production" Service* REG. U.S. PAT. OFF.

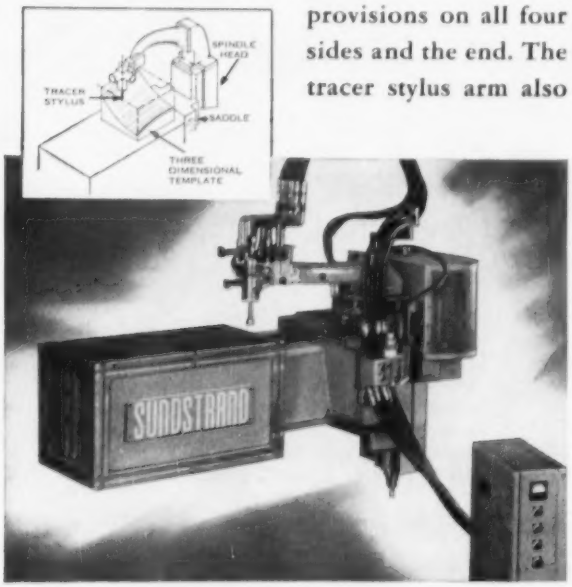
AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS





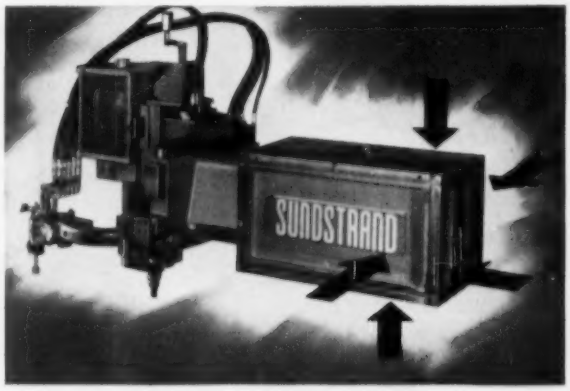
space is required to do the work and greater accuracy can be maintained. Because the unit can be readily positioned, changes in product design can quickly be accommodated without obsoleting the basic equipment.

The ram support of the unit has transverse and longitudinal keyways with suitable mounting provisions on all four sides and the end. The tracer stylus arm also has several manual mounting positions to further increase the possible uses of the unit.



Tracer unit showing application of template (in sketch).

The transverse and longitudinal movements of the cutter are 12 inches with a depth movement of 8 inches. All three movements are manually controlled from a single pencil type stylus tracing unit to enable duplication of the template on the work piece. Each movement has a quick shut-off valve for independent use of any one movement. The cutter head slide has a micrometer screw depth stop for accurate depth location for the full range of cutter travel. The linear and depth duplicating speed of the cutter is variable within a range of 1″ to 50″ per minute.



Tracer unit showing mounting provisions on all four sides and end.

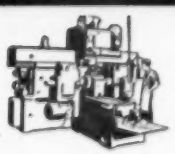
The stylus has a positive lock adjustment on all three movements to enable the locating of the cutter in relation to the stylus on the template. To allow for the changing of various size tracing stylus without changing the cutter, a quick change positive lock stylus chuck has been provided.

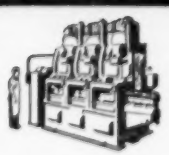
The unit shown has a belt driven 3 h.p. head with 4 possible speed changes of 200, 400, 900 and 1800 r.p.m. Also available is a 3 h.p. head with infinitely variable speeds between the range of 200 to 1800 r.p.m. In addition, 5 h.p. heads of either the 4 speed belt driven type or the infinitely variable speed type can be furnished.

Additional Data

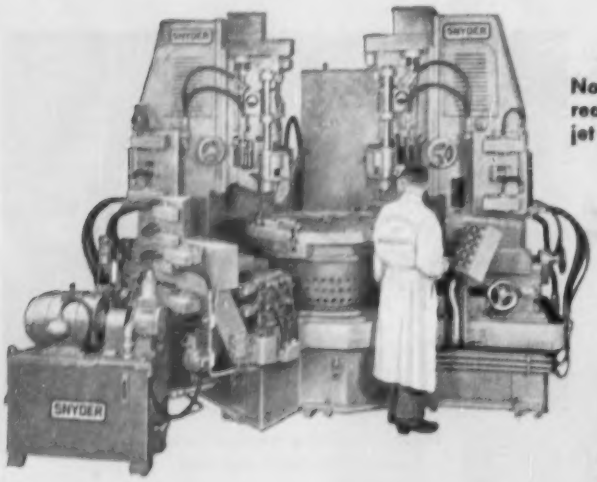
covering this unit is available upon request. Write for this information today. Ask for Bulletin 166.

TRIPLEX RIGIDMILS | SPECIAL MACHINES



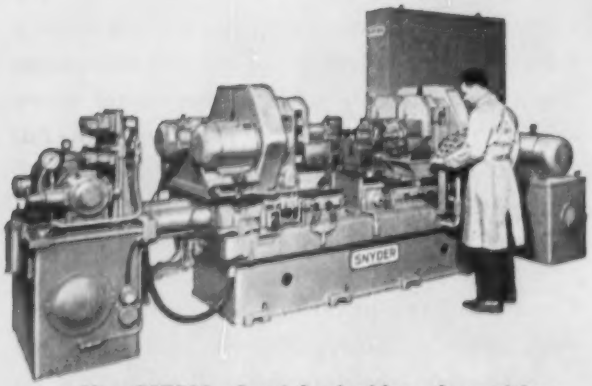


SUNDSTRAND
Machine Tool Co.
2533 Eleventh St. • Rockford, Ill., U.S.A.

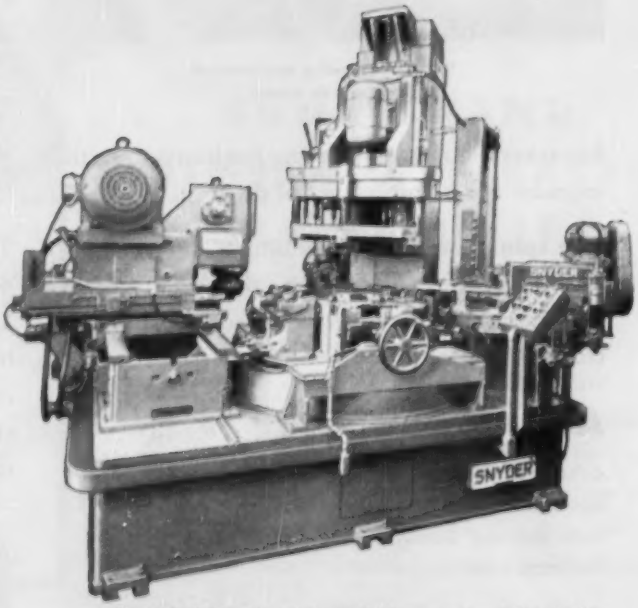


No. 70165—Special index machine to drill and ream holes in rims of outer shroud spacers for jet engines. Production 2 parts per hour.

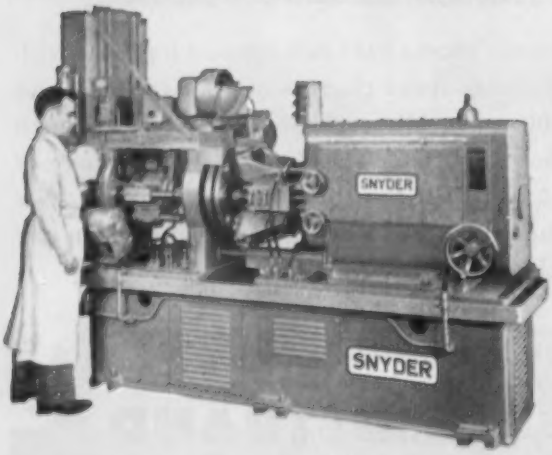
No. 65412—Special automatic machine, for weighing and precision balancing a variety of heavy-duty and diesel engine connecting rods from 7⅝" to 12" center distance. Weighs rods and automatically balance mills to plus or minus 2 grams.



No. 207390—Special, double-end precision boring machine for finish boring, counterboring and chamfering counter shaft, intermediate and shifter shaft holes on power take-off cases. Production 82 pieces per hour at 80% efficiency.



No. 73902—Special 4-station automatic index machine for milling joint face, drilling and reaming vertical and horizontal holes in exhaust manifolds. Production 80 pieces per hour at 80% efficiency.



No. 68526—Special double end trunnion machine, fully automatic, for machining special aircraft rivets. Machine is automatically loaded and unloaded. Production rate varies with size of rivet.

SNYDER VERSATILITY

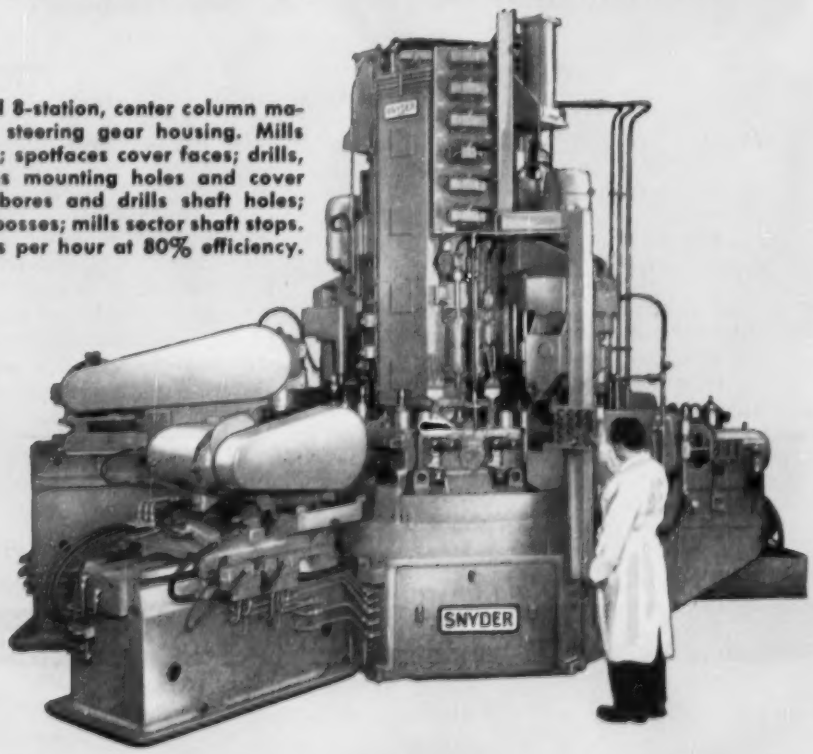
In engineering and building metal-cutting machines includes not only the great Snyder line transfer machines with automation, but also many smaller and diversified machines in which the standards of performance and economy are no less exacting. A few representative examples are shown.

SNYDER

TOOL & ENGINEERING COMPANY

3400 E. LAFAYETTE • DETROIT 7, MICHIGAN

31 Years of Special Machine Tools with Automation



No. 72976½—Special 8-station, center column machine for processing steering gear housing. Mills pads and cover faces; spotfaces cover faces; drills, countersinks and taps mounting holes and cover holes; rough counterbores and drills shaft holes; mills two Welch plug bosses; mills sector shaft stops. Production 260 pieces per hour at 80% efficiency.

Advertisement | CONSOLIDATED MACHINE TOOL CO.

now available in commercial quantities

new high strength

OXIDE cutting tool

STUPALOX

Cuts cast steel, cast iron, chilled iron, carbon steel, high-speed steel, non-ferrous metals

Performance up to ten times the speed and four times the wear-resistance of other tools

for example

High-Speed Steel In machining high speed steel (207-B annealed) with hardened high speed steel tools, cutting speed was from 80 to 100 sfpm. Stupalox provided a cutting speed of 505 sfpm with .023" feed and .125" depth of cut.

SAE 1035 Steel SAE 1025 steel was cut with tungsten carbide tools at a speed of 250 to 350 sfpm. Stupalox cut the same material on the same machine at 1175 sfpm. Feed was varied from .015 to .005 and the depth of cut from .005 to .250 to demonstrate the tool's versatility.

* * *

STUPALOX is the result of thirty years of development of special-purpose oxides, by Stupakoff, one of the country's leading manufacturers of technical ceramic products. Stupalox tools are available *now*, in commercial quantities, and in a variety of sizes and shapes. Write for complete information and technical data.

SEND FOR DESCRIPTIVE BULLETIN NO. 156

Stupakoff
Division of
The CARBORUNDUM Company

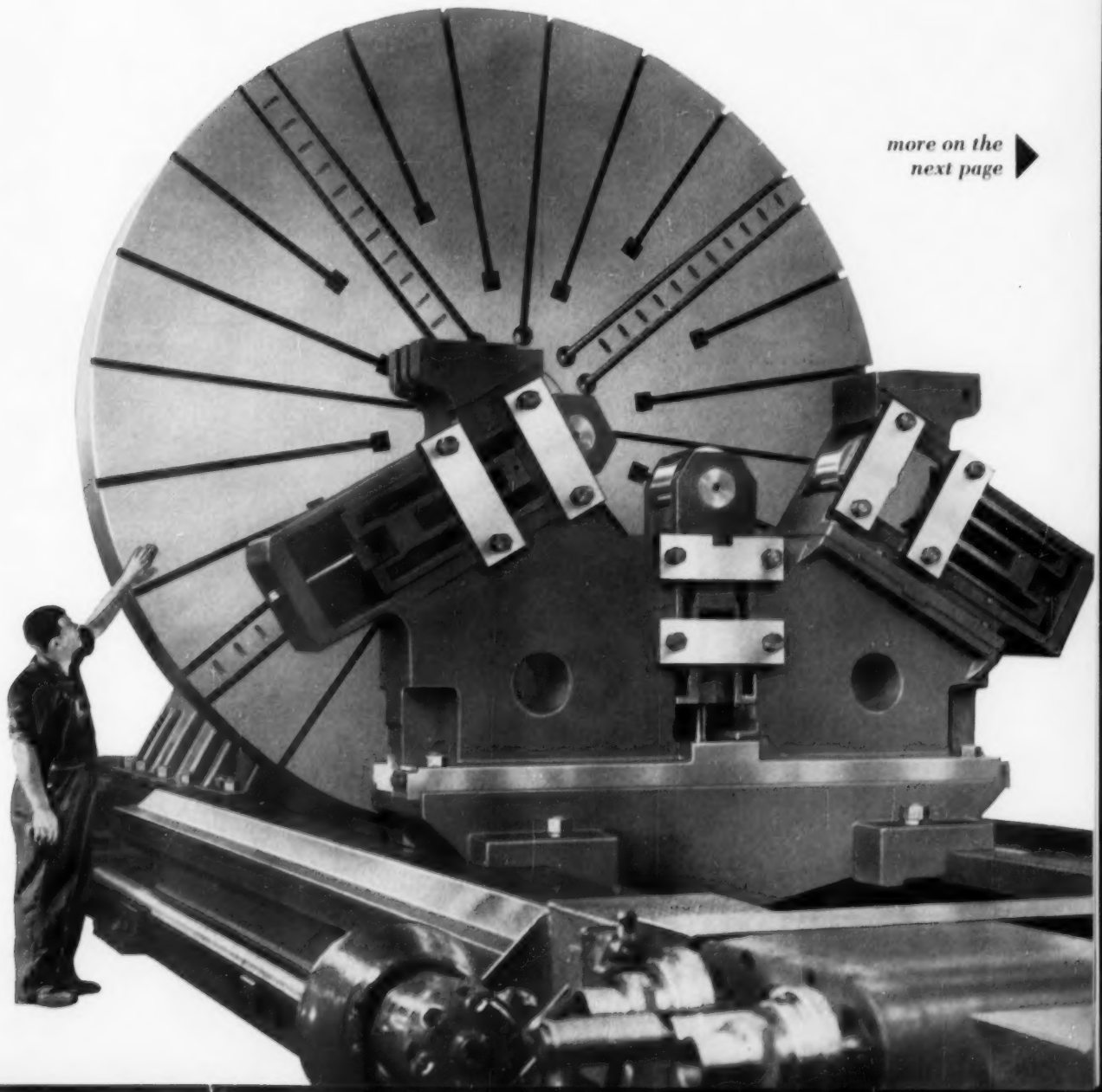
LATROBE, PENNSYLVANIA

The man's no midget

He's 6 feet tall and the lathe is the heaviest and most powerful general purpose lathe ever built in the U. S. A.

Consolidated built it of course, and the price (if you are interested) is around a half million dollars.

more on the next page ▶



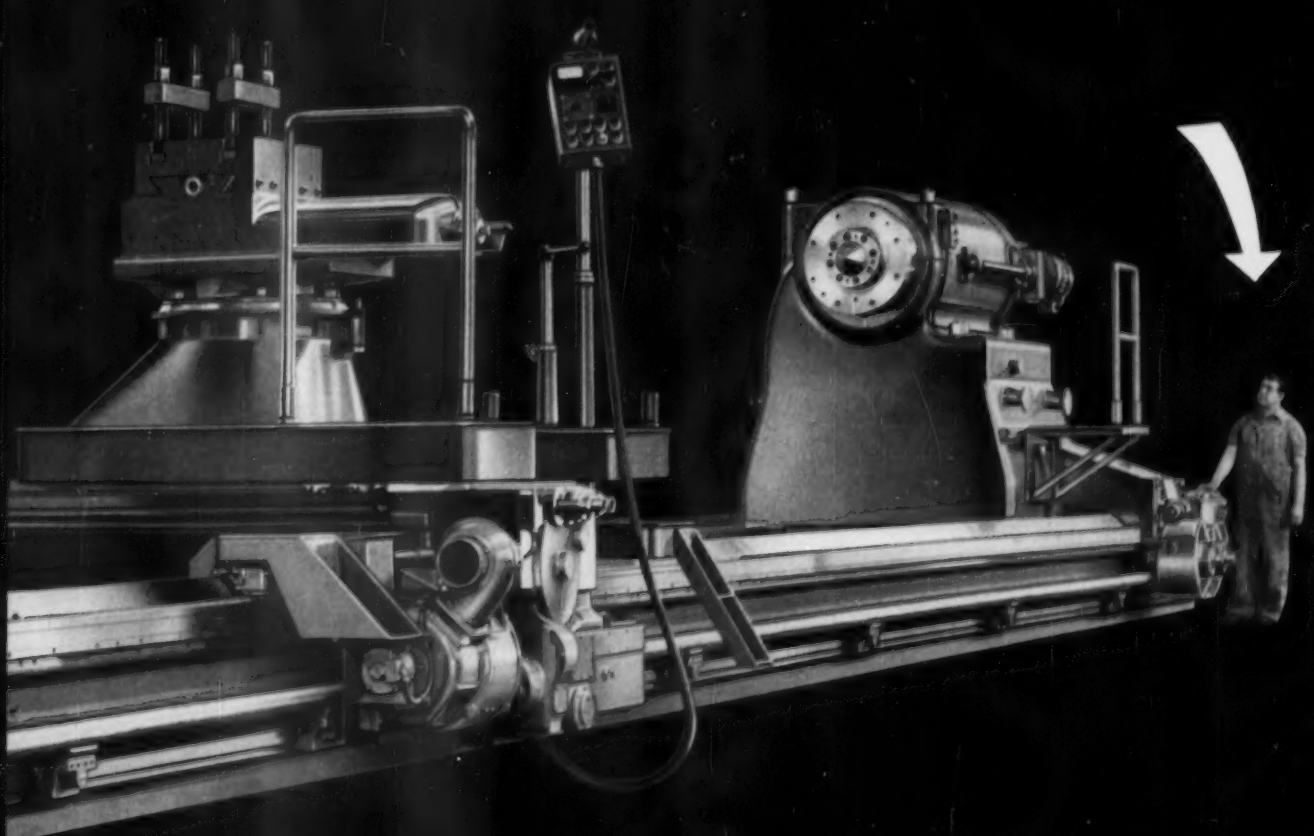
a half-
BETTS

million dollar lathe

. . . the heaviest and most powerful ever built in America!

Some highlights on the new 12 foot BETTS HEAVY DUTY LATHE:

- The head and tail stock centers alone (without steady rests) will support work pieces *weighing up to 250 tons!*
- The big super-precision spherical roller type spindle bearings are 36 *inches in diameter!*
- The lathe shown (60 foot centers) weighs 245 tons.
- The front way of the bed is nearly 3 feet wide.
- The taper attachment turns tapers *up to 14 feet long* in one setting!
- The head stock is built for a 250 HP driving motor.



Advertisement | CONSOLIDATED MACHINE TOOL CO.

more on the next page ▶

the 30 ton tail stock

Its huge live center revolves in precision roller bearings nearly two feet in diameter.

These lathes are big, but more than bigness is the quality of engineering thinking that goes into them.

For example, this big lathe is electronically controlled. The operator runs it at the cutting tools with his eyes on the cut. Infinitely variable feeds and speeds are on a portable panel at his finger tips and he can change them in fine increments *while the tools are cutting!* Power traverse is there, too. There are also such features as the adjustable spring loaded tail stock spindle that compensates for the elongation of the work piece as its temperature rises.

This is the kind of thinking that goes into Consolidated Machine Tools.

CONSOLIDATED MACHINE TOOL CO.

ROCHESTER, NEW YORK

CONSOLIDATED MACHINE TOOLS

A DIVISION OF FARREL-BIRMINGHAM CO., INC.

F/B

44% FASTER

NEW ROTOR D-4 GRINDER

pays for itself in one month

JOB: Grinding edges and holes of flame-cut tube hanger plates with 4" plug wheels.

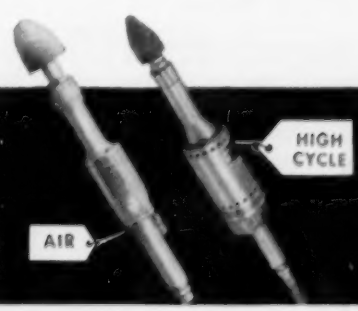
FORMERLY: Used 4500 rpm grinders. Output: 50 pieces per day.

NOW: Use new Rotor D-4 8500 rpm Grinders. Output: 72 pieces per day.

RESULTS: 44% more output paid off cost of new Rotor Grinders in one month. After that, it's pure savings.

Find out from your nearby Rotor Analyst how *you* can cut costs with the D-4 and other new Rotor portable tools! Ask for a demonstration.

ASK FOR BULLETIN NO. 43



THE ROTOR TOOL CO.
CLEVELAND, OHIO
UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

Processed only by nature!...

Offered only by Norton!...

A "natural" for many barrel-finishing applications. The new Tumblex "N" abrasive, offered exclusively by Norton comes in sizes ranging from 3/16" by 3/4" to 1 5/8" by 2 1/2".

NEW TUMBLEX "N" TUMBLING ABRASIVE

Natural abrasive brings value-adding, cost-cutting "TOUCH of GOLD" advantages to barrel-finishing

Tumblex "N" Abrasive is Nature's own tumbling abrasive. Carefully selected and graded by Norton, it opens up new possibilities for barrel-finishing applications such as light deburring, breaking sharp edges, polishing and burnishing and other operations where little actual cut is required. It is especially suited for work on die castings.

Tumblex "N" has proved particularly valuable in bringing out the most desirable color of the finished part. Metals on which it has proved its ability to give an excellent finish include zinc, brass, copper, aluminum and various forms of steel, including stainless.

Its rounded, uniform shape and very low breakdown ratio permit longer cycles and reduce the need of rescreening.

Another big Tumblex "N" advantage is extremely uniform cutting action. This assures the same uniform finishing in load after load. Also, it enables close regulation of cut; for example, by adding measured quantities of loose abrasive grain to Tumblex "N" you can speed up the rate of cut with little effect on the life of this natural abrasive. Exact formulas for best results in job or production tumbling are easily worked out.

Norton customers who have tested Tumblex "N" Abrasive report:

- ***"Very good luster with no noticeable wear."***
- ***"Fine performance. Very little breakdown. Reordering 700 pounds of sizes 2½T and 3½T."***
- ***"Color O.K. on both zinc and brass."***
- ***"Very long life. Gave excellent color on stainless steel."***
- ***"A good polishing stone on aluminum."***

Send Your Work Samples

Let us demonstrate in our newly enlarged Sample Processing Department how Tumblex "N" Abrasive can give the value-adding "Touch of Gold" to your product quality and cut your barrel-finishing time and costs. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone directory, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass. G-303

NORTON

ABRASIVES

Making better products... to make your products better

NORTON COMPANY
Abrasives • Grinding Wheels
Grinding Machines • Refractories

BEHR-MANNING Division
Coated Abrasives • Sharpening Stones
Pressure-Sensitive Tapes

Less machining time and less spoilage

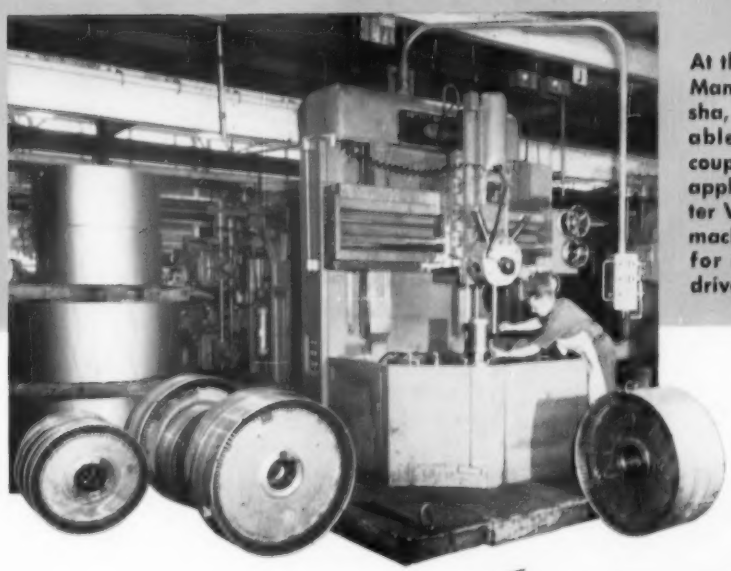
Results in

30% increase in production

With a.. **BULLARD** **...**

CUT MASTER V. T. L.

MODEL 75



At the Dynamatic Division of Eaton Manufacturing Company at Kenosha, Wisconsin, producers of adjustable speed eddy-current drives, couplings and brakes for industrial applications, the Bullard Cut Master V.T.L., Model 75 is employed to machine the clutch rotor assembly for a big industrial punch press drive.

OPERATIONS

FIRST CHUCKING

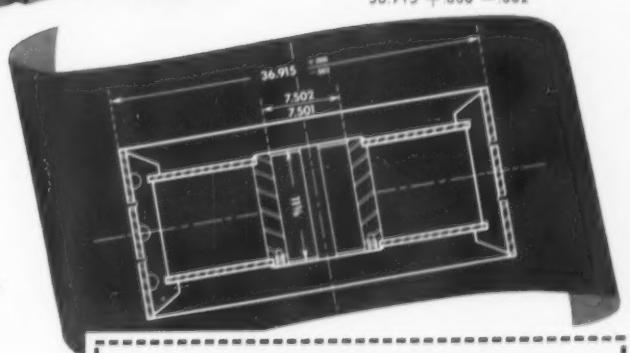
1ST FACE HUB

2ND ROUGH & FINISH BORE
7.502" to 7.501"

SECOND CHUCKING

1ST FACE RIM

2ND ROUGH AND FINISH O.D.
36.915 + .000 — .002



Both operator and management praise the performance of the Cut Master, Model 75, "there's no comparison; the old machines I had to fight . . . this one holds once it is set. Setting up is easier and the controls are handy . . . it is easy to keep up work standards with a minimum of spoilage." The advantages embodied in the Bullard Cut Master V.T.L., Model 75 can be applied to your machining problems.

CALL YOUR NEAREST BULLARD SALES OFFICE OR DISTRIBUTOR OR SEND FOR COMPLETE CATALOG TO

THE BULLARD COMPANY

286 CANFIELD AVENUE — BRIDGEPORT 9, CONNECTICUT

Please send me a copy of the

NEW CUT MASTER V.T.L., MODEL 75 CATALOG

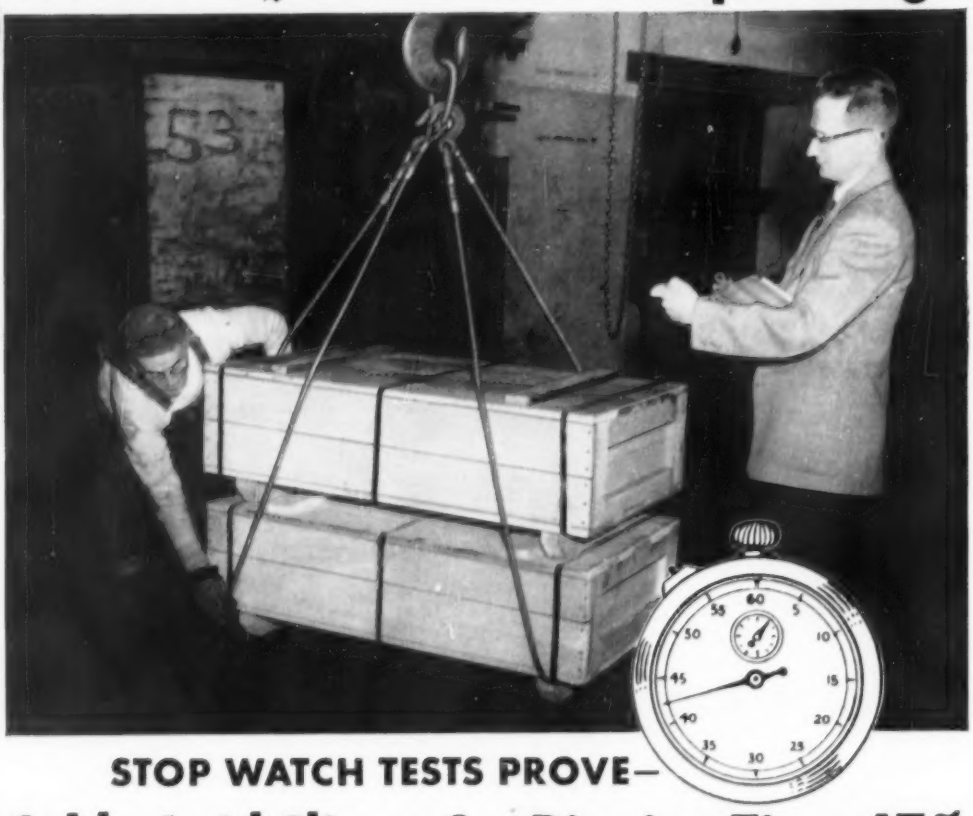
NAME _____

COMPANY _____ POSITION _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

ACCO Registered* Wire Rope Slings



STOP WATCH TESTS PROVE—

Cable-Laid Slings Cut Rigging Time 47%

• An eastern manufacturer ran time and motion studies on handling the two heavily loaded crates shown above. He found that his riggers could cut their time 47% when Cable-Laid Slings were used, instead of slings of standard construction.

For Cable-Laid Slings combine the flexibility of manila rope with the strength of steel. To this flexibility they add extreme resistance to kinking, and freedom from crankiness. As a result they are easy to handle—cut operating time. And they keep their ease of handling long after slings of standard construction are kinked and snarled to the point of uselessness.

This performance is possible only because of the combination of a special wire rope construction with ACCO's patented DUALOC ending. GALACCO coating, an ACCO exclusive, keeps Cable-Laid Slings bright and clean and imparts maximum corrosion resistance.

SAFEST SLINGS MADE • When you buy an ACCO *Registered* CABLE-LAID SLING, you are getting safeguards that make them the safest slings you can find.

Each individual component, made from the highest quality material suited to its use, is tested before assembly. It must prove to have strength equal to or greater than the sling body. These components are then assembled into slings according to precisely-engineered designs which have proved their safety and reliability in extensive field tests.

Each completed sling is then proof-tested at twice the load-carrying capacity for which it is rated. Then, and only then, does it receive the coveted ACCO registration certificate and tag.

Get the details on Cable-Laid, or any other ACCO *Registered* Wire Rope Slings, from your distributor—or call the nearest ACCO district branch below.

*Trade Mark Registered

FREE FOLDER • Write Wilkes-Barre office for your copy of new folder **DH-532**, which gives strengths and weights (for six different lifts) on a full size range of ACCO *Registered* Cable-Laid Slings.

ACCO

American Chain & Cable Company, Inc., Wire Rope Sling Department

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn. In Canada: Dominion Chain Co., Ltd., Niagara Falls, Ont.

TRADE MARK

Got a pain in the neck?

IF GRINDING PROBLEMS ARE GIVING YOU A PAIN IN THE NECK, SWITCH TO CINCINNATI (PD)° WHEELS. For *now* CINCINNATI Grinding Wheels offer POSITIVE DUPLICATION—a remarkable achievement in precision manufacturing and quality control that *can save you money . . . and increase your production.*

And we're definitely not sticking out our neck when we make these claims, because through the CINCINNATI (PD) Manufacturing Process you are assured Positive Duplication of the original wheel *every* time you reorder. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

Yet CINCINNATI (PD) WHEELS *are priced no higher than ordinary wheels.* So, we think you'll agree it's worth investigating CINCINNATI (PD) WHEELS right away.

Just contact us and we'll send one of our representatives—men who know grinding and grinding machines as well as grinding wheels. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

Remember—*only* CINCINNATI Grinding Wheels give you . . .

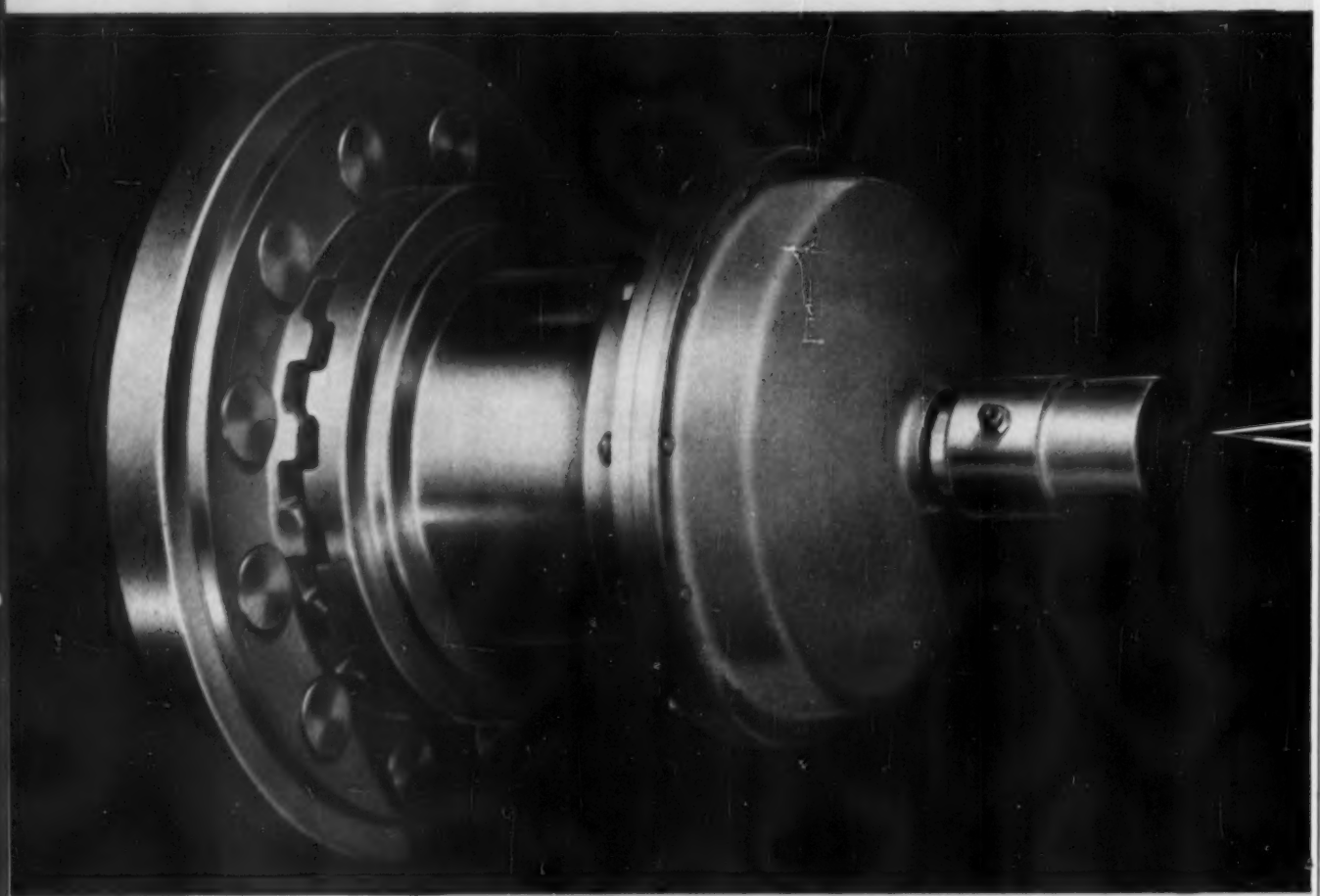
(PD) POSITIVE DUPLICATION.
°Trade Mark Reg. U.S. Pat. Off.

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

CINCINNATI° *Grinding Wheels*

Exclusive NIAGARA Electro-

A prime factor in the operating economy



● Examine it. See it operate. Try it yourself. Compare it point for point. The Niagara Electro-Pneumatic Clutch is distinctly superior in every respect: hourly output ... ruggedness ... simplicity ... safety ... savings in operation and maintenance. *It's functionally different in every major detail!*

There, in a nutshell, you have one of the principal reasons why Niagara presses continually out-perform all others. For fact-loaded details, as applied to single or double crank inclinable, gap frame, horn and deep throat presses, request specific literature and consult with a Niagara representative.

NIAGARA MACHINE & TOOL WORKS · BUFFALO 11, N. Y.

DISTRICT OFFICES:
Buffalo • Cleveland • Detroit • New York • Philadelphia
Dealers in principal U. S. cities and major foreign countries

Pneumatic Clutch

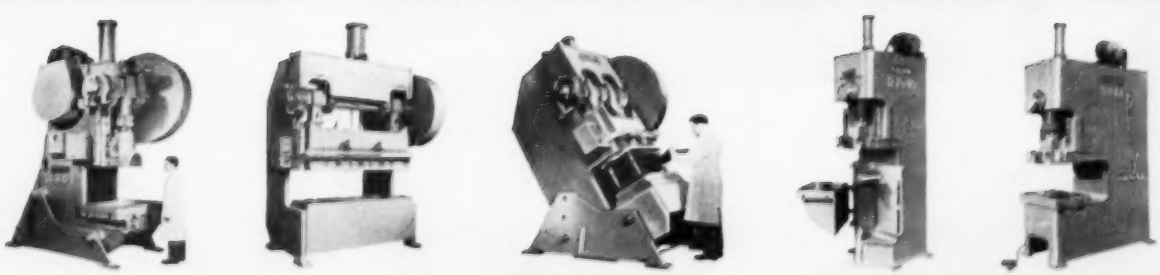
greater output, safety and of Niagara Presses

For Better Performance and Safety

- ENGAGES AND DISENGAGES INSTANTLY at any point in the stroke.
- CAN BE SINGLE-STROKED, JOGGED (forward and in reverse) or operated continuously.
- STOPS INSTANTLY by push button, electric eye, limit switch or similar devices — regardless of crank position.
- PROVIDES EFFORTLESS PRESS OPERATION by palm buttons or foot switch.
- FAILS SAFE. Press stops automatically if electric current or air pressure fails.

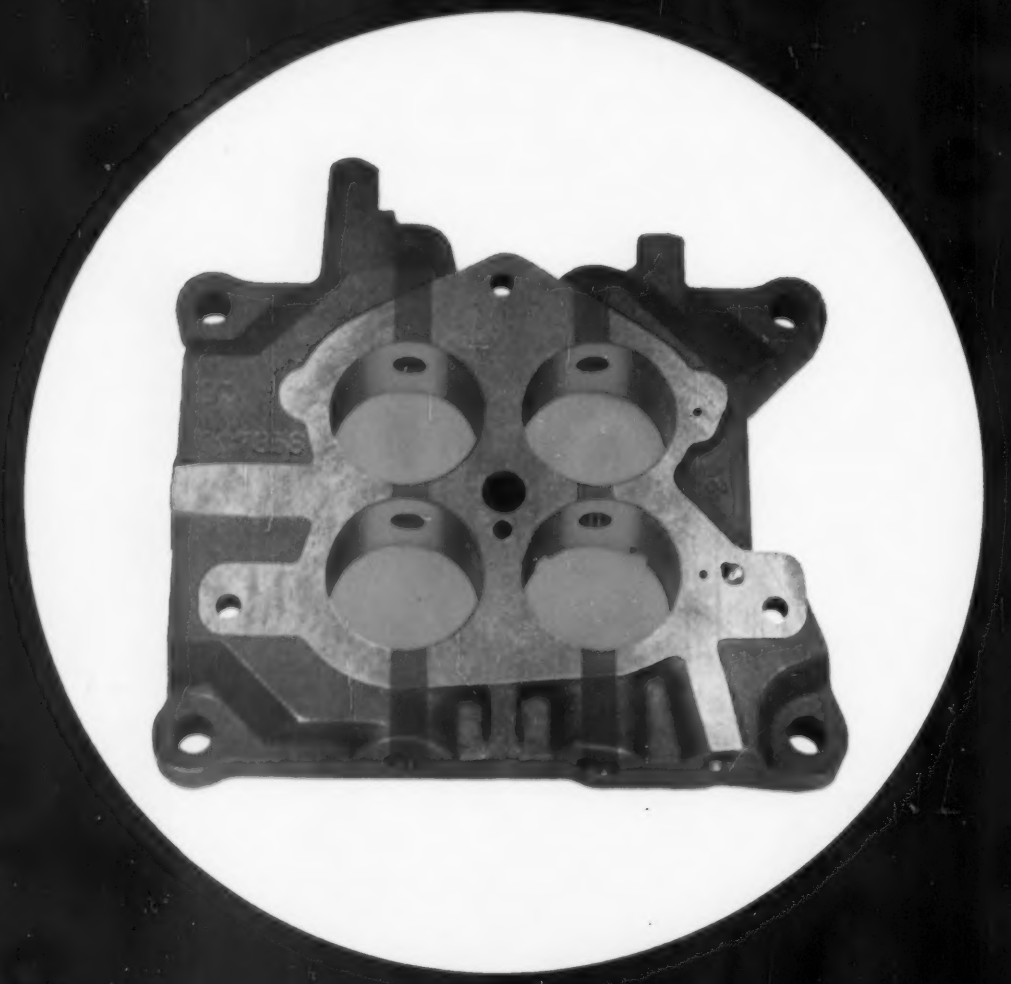
For Less Maintenance

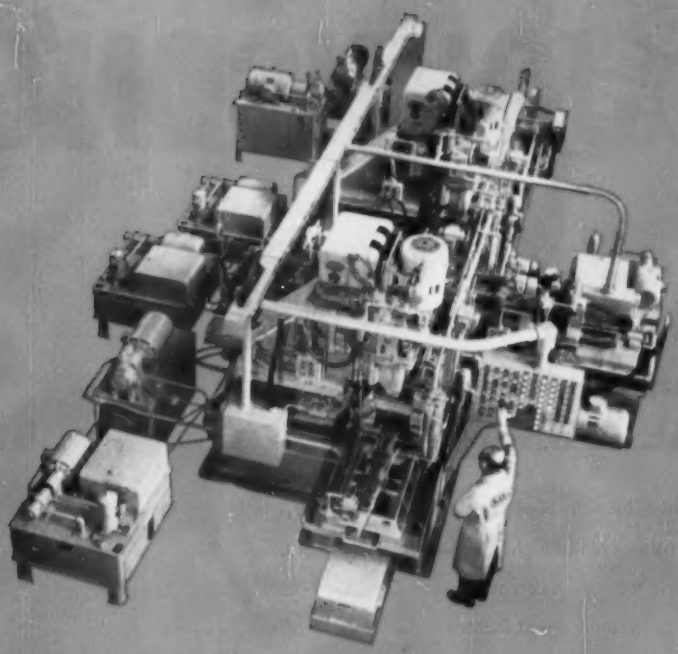
- NO FRICTION SURFACES to slip, heat up and wear.
- SIMPLE, COMPACT DESIGN. Nothing to adjust.
- LOW INERTIA. Small in diameter. Operates directly on crankshaft, *the slowest rotating shaft*. No gears nor high speed shafts, etc. to start and stop
- LENGTHENS GEAR LIFE. Wear is distributed uniformly, because engagement load is not always applied to same teeth.
- RUNS IN SEALED BATH OF OIL to minimize wear.
- EASILY ACCESSIBLE. Mounted at end of shaft, external to flywheel.
- NO BUCKING of clutch vs. brake.



America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

Here's Automatic Production On High-precision Parts





When is fast transfer production limited by precision requirements? This frontier is steadily being pushed back by Natco engineers in new Holeway processing machines.

Take this throttle body, for example. The large holes are reamed to *limits of .0015" for location, .0003" for size, 125 microinch* finish! Production—*600 parts per hour!*

Natco's high-speed gun-drilling heads give required finish in interrupted throttle-shaft holes without reaming. Size is held to within .001".

Many unusual problems are solved in locating, holding and positively controlling light-weight parts between stations at high transfer speed. Chip disposal is automatic; cutting oil is filtered for re-use.

Here's the sequence of operations. Combination rough and semi-finish ream four large holes. Gun drill two holes (two breakthroughs each). Finish ream four large holes.

***Whenever* fast, automatic production makes sense, don't let high-precision requirements stop you. A Natco engineer can tell you in a hurry whether it's feasible and how the job can be done.**

National Automatic Tool Company, Inc.

Richmond, Indiana

Multiple-spindle drilling, boring, facing and tapping machines
Special machines for automatic production

NATCO

Notes from Natco...

Beating the Index Hex

Common design dilemma . . . heavy rotating tables and high-speed indexing just don't want to mix. Priding ourselves on being good mixers, we added a hydraulic decelerating device, giving us tables that index faster than ever and still stop on a gnat's eyelash.

Automatic Squirt

Universal joints universally demand frequent lubrication. Our adjustable joint-drive heads now include automatic lubrication. Once the timer's set, the oil will jet . . . at any time interval you select. One more thing the operator can forget about.

One Will Get You Four

Here's an investment return that makes Florida real estate look like shaky speculation. Sixteen months ago one of our customers bought a new Natco light sensitive multi-driller and tapper. Cost . . . under $5,000. To date they report direct labor savings of $20,000.

Processed by Natco Machines

Part: Front Axle Support
Machine: Natco 3-way horizontal
Operations: Drill 7 holes; Core drill 1 hole; Combination drill and chamfer 4 holes; Combination drill and spotface 1 hole; Tap 11 holes
Production: 16 per hour

Part: Crankshaft
Machine: Natco trunnion type
Operations: Drill, face and tap 1 hole; Drill, chamfer and ream 6 holes; Drill, semi-finish and finish ream 1 hole; Drill and ream 1 hole; Tap 6 holes
Production: 42 per hour

Part: Steering knuckle
Machine: Natco trunnion type
Operations: Spotdrill 4 holes; Drill 5 holes; Spotface 5 holes; Ream 2 holes; Combination ream and counterbore 1 hole
Production: 250 per hour

NEW! JOHNSON'S

New to the Johnson line of guaranteed Metal-Working Fluids, J-COOL is an all-purpose water-soluble Coolant. It offers:

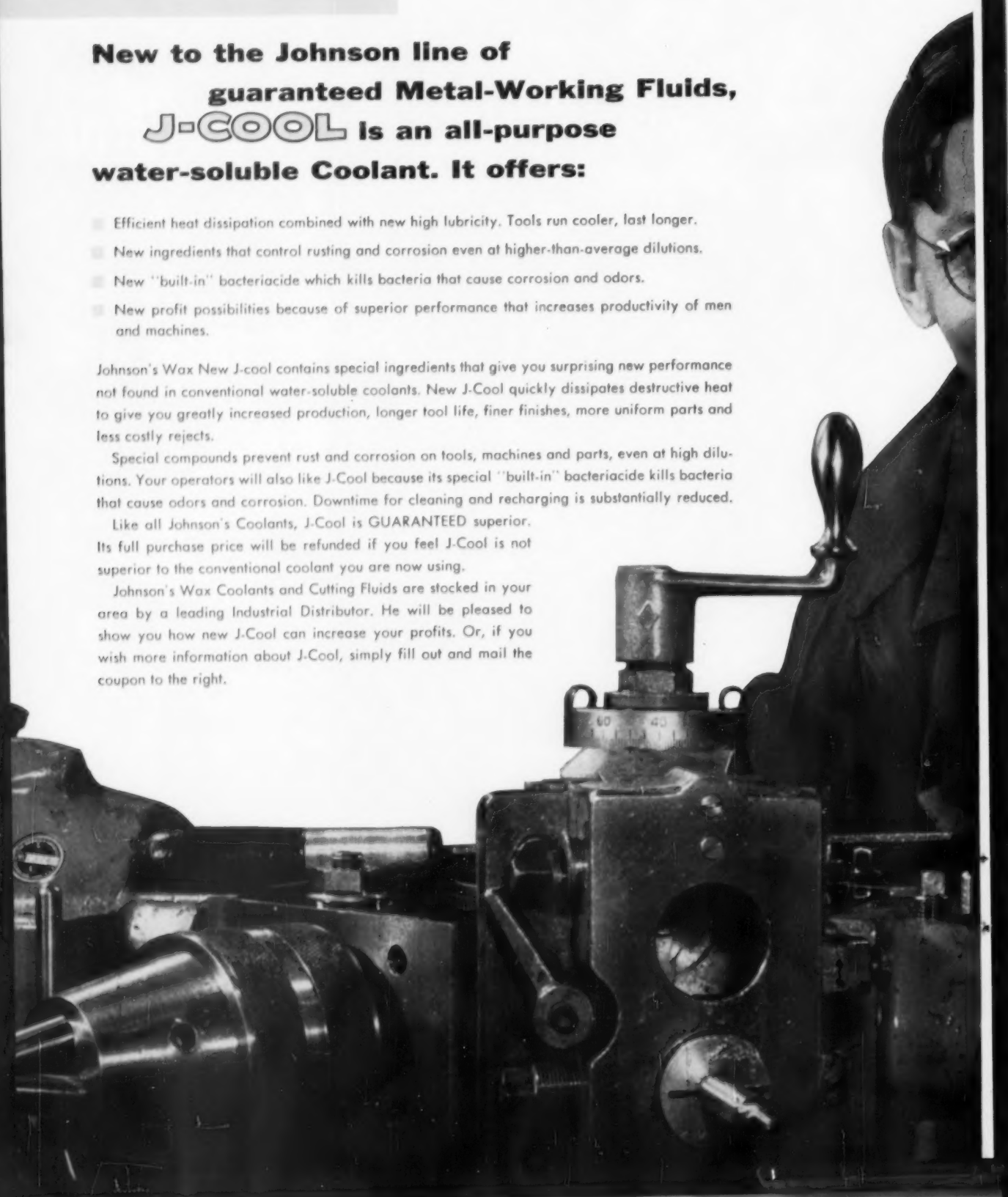
- Efficient heat dissipation combined with new high lubricity. Tools run cooler, last longer.
- New ingredients that control rusting and corrosion even at higher-than-average dilutions.
- New "built-in" bacteriacide which kills bacteria that cause corrosion and odors.
- New profit possibilities because of superior performance that increases productivity of men and machines.

Johnson's Wax New J-cool contains special ingredients that give you surprising new performance not found in conventional water-soluble coolants. New J-Cool quickly dissipates destructive heat to give you greatly increased production, longer tool life, finer finishes, more uniform parts and less costly rejects.

Special compounds prevent rust and corrosion on tools, machines and parts, even at high dilutions. Your operators will also like J-Cool because its special "built-in" bacteriacide kills bacteria that cause odors and corrosion. Downtime for cleaning and recharging is substantially reduced.

Like all Johnson's Coolants, J-Cool is GUARANTEED superior. Its full purchase price will be refunded if you feel J-Cool is not superior to the conventional coolant you are now using.

Johnson's Wax Coolants and Cutting Fluids are stocked in your area by a leading Industrial Distributor. He will be pleased to show you how new J-Cool can increase your profits. Or, if you wish more information about J-Cool, simply fill out and mail the coupon to the right.



WAX J-COOL

**Guaranteed superior ...or your money back*

A PRODUCT OF JOHNSON'S WAX

S. C. JOHNSON & SON, INC.
Industrial Products Division, Dept. AM-46
Racine, Wisconsin

Please send me additional information about J-Cool.

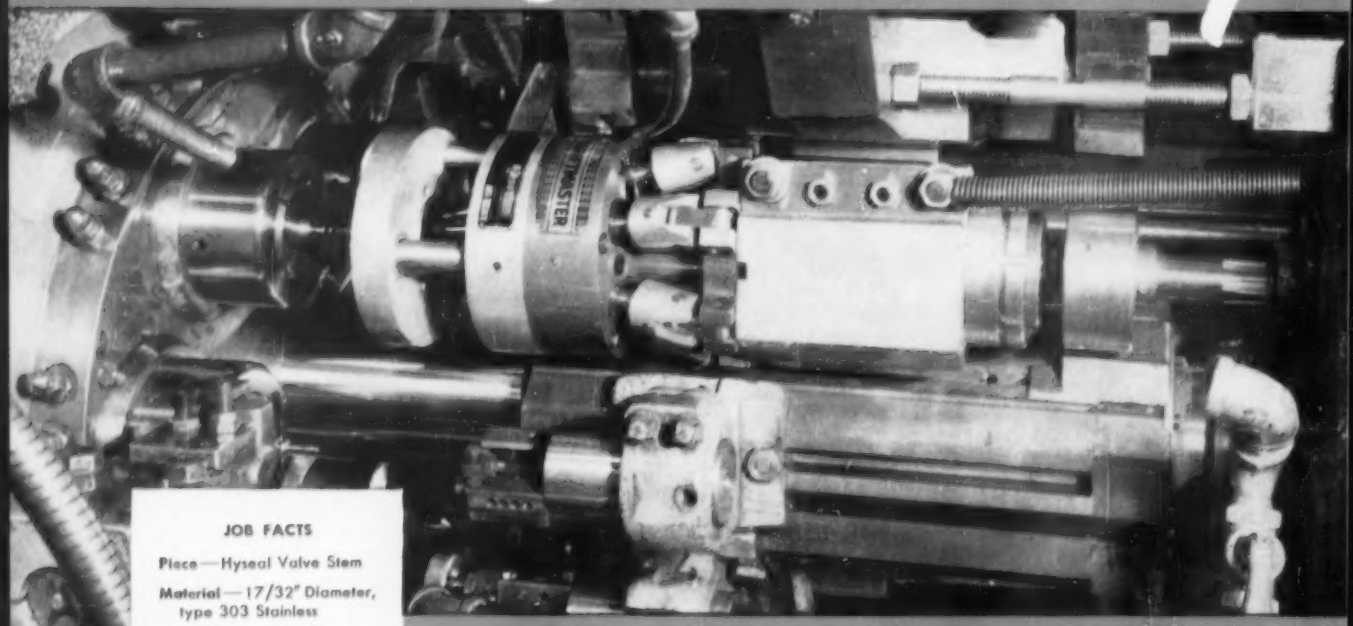
Name_____

Firm Name_____

Address_____

City_____ Zone____ State____

with Acme-Gridley



JOB FACTS

Piece—Hyseal Valve Stem

Material—17/32" Diameter, type 303 Stainless

Operations—10, including multiple end milling of six half-holes at a 15° angle

Machine Time—12 seconds

Machine—1-1/4" RA-6 Acme-Gridley Bar Automatic

Schaible Single-Lever Kitchen Mixing Faucet lets you select both the temperature and amount of water you need with one simple motion—the boon to modern living.

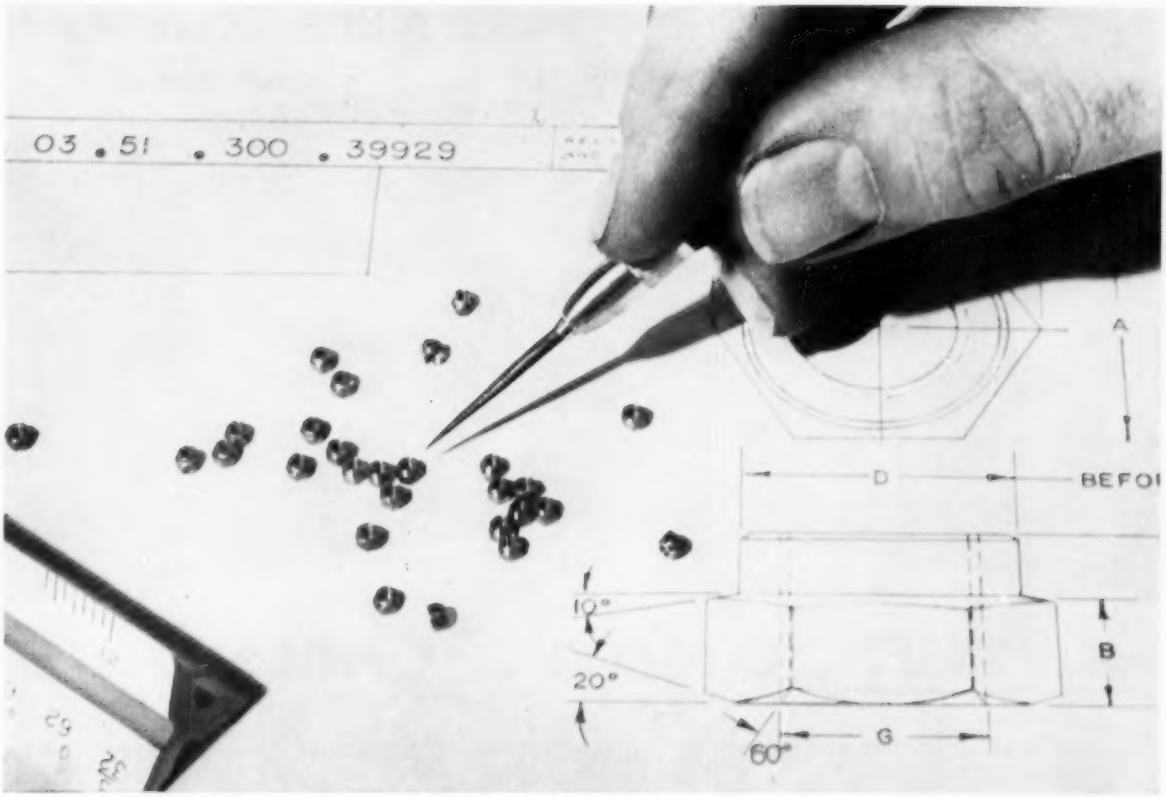
you get CLOSER TOLERANCES with more operations in a single setup

Following exhaustive study of other methods, the Schaible Company found that the only method of producing this valve stem to their rigid specifications at a reasonable cost was on a six-spindle Acme-Gridley bar automatic. Ten operations (including multiple end milling of six half-holes on a 15° angle) were performed in a single setup in 12 seconds machine time. Specifications required a 20 microinch finish to avoid wear on nonferrous components and working to limits of .002" t. i. r. between seating surface and end of valve stem.

BULLETIN TP-44 *shows tooling setups on 44 different bar jobs. Write today for your free copy and learn how both greater accuracy and reduced costs can be yours on an Acme-Gridley.*

National Acme

THE NATIONAL ACME COMPANY • 171 EAST 131ST STREET • CLEVELAND 8, OHIO



FLEXLOC MICROSIZE locknuts meet designers' needs for tiny precision nuts that retain strength and holding power in the smallest assemblies—servomechanisms, electronic and electrical equipment, all miniature devices.

Design Lighter, More Compact Products with New FLEXLOC Microsize Locknuts

Standard Microsize Locknuts Permit Design Engineers to Develop and Fasten Smaller Assemblies Safely

SIZE	Across Flats		Shoulder Height		Across Corners	Height +.000 −.003
	MAX.	MIN.	MAX.	MIN.	MIN.	
0-80 NF-3B	.111	.107	.047	.042	.123	.075
1-64 NC-3B	.127	.123	.0635	.0585	.141	.090
1-72 NF-3B	.127	.123	.0635	.0585	.141	.090
2-56 NC-3B	.158	.153	.068	.063	.176	.105
2-64 NF-3B	.158	.153	.068	.063	.176	.105
3-48 NC-3B	.190	.183	.071	.066	.210	.120
3-56 NF-3B	.190	.183	.071	.066	.210	.120
4-40 NC-3B	.190	.183	.072	.067	.210	.120
4-48 NF-3B	.190	.183	.072	.067	.210	.120

STANDARD MICROSIZE FLEXLOCs—in sizes ranging from 0-80 to 4-48—are available in brass (either plain or cadmium plated). Consult SPS for miniature nuts of other conventional materials.

New FLEXLOC Microsize locknuts are smaller and lighter than regular FLEXLOCs of the same nominal diameter. Wrenches of smaller size are used to install them. Mating joints or flanges can be designed smaller—with no loss in strength or convenience of assembly.

Microsize FLEXLOCs have all the advantages of larger FLEXLOCs. One-piece, all-metal construction—nothing to put together, come apart, lose or forget. Use them as lock or stop nuts—they stay put anywhere on a threaded member as soon as the locking threads are fully engaged. Uniform locking torques insure accurate preloading. There are no nonmetallic inserts to pop out or deteriorate. Moisture, dryness, oil, temperatures to 250°F won't affect these Microsize FLEXLOCs. Just screw them on. They lock and stay locked. Vibration won't shake them loose.

For complete information on Microsize FLEXLOCs, consult your authorized SPS distributor. Or write STANDARD PRESSED STEEL CO., Jenkintown 1, Pa.

STANDARD PRESSED STEEL CO.

FLEXLOC LOCKNUT DIVISION SPS

JENKINTOWN PENNSYLVANIA

WIN a 2-weeks LUXURY

All Expenses Paid,

ENTER JONES & LAMSON'S

NEW HORIZONS

Grand Prize:

Two-Weeks Luxury Vacation Trip for Two, All Expenses Paid, to a choice of one of the following: Paris, Hawaii, The Caribbean, The Canadian Rockies, Plus $400 for spending money, baby sitter fee, etc.

Two 2nd Prizes: Each a Seven-Day All-Expenses-Paid Luxury Vacation for Two to Bermuda. Plus $200 spending money.

Three 3rd Prizes: Each a Shopmaster Combination Saw-Jointer Power Tool, complete with motor.

Ten 4th Prizes: Each a Shopmaster Individual Single-Purpose Power Tool (A Choice of Saw, Drill Press, Jointer, etc.)

Jones & Lamson, famed for opening up NEW HORIZONS in metalworking efficiency, now offers you, personally, NEW HORIZONS — a luxury vacation for two people for two weeks with all expenses paid, to your choice of Paris, Hawaii, The Caribbean or The Canadian Rockies.

Think of it — you can enjoy deluxe travel, finest hotels and accommodations, the very best of everything, plus $400 spending money. Live like a millionaire for two weeks, for just answering this question, "Which Jones & Lamson machine, or machine feature, could, or does, help you most, and Why?"

When you write in (use coupon or not, as you wish), we will send you an official entry form, together with information upon which to base your answer. So don't delay! Even if you've never entered any contest before . . . if you have a good idea and can express it clearly — *YOU* may win this glorious luxury vacation for two! And don't forget — there are other prizes! — two deluxe 7-day all-expenses-paid vacations for two to Bermuda, and 13 prizes of famous Shopmaster home workshop Power Tools! Enter *today!* Read the simple rules, and send in this coupon *NOW!*

J&L. JONES & LAMSON MACHINE COMPANY

502 CLINTON STREET, SPRINGFIELD, VERMONT

VACATION FOR TWO!

to your choice of . . .

CONTEST TODAY!

CONTEST RULES

Contest is open to all persons, residing in the continental U. S. A., engaged in metalworking or allied industries, except employees of Jones & Lamson Machine Company, its selling agents and its advertising agency, and members of their families.

Contestants merely answer, in 150 words or less, the question "Which Jones & Lamson Machine, or Machine Feature, could, or does, help you most, and Why?"

Entries are to be mailed to Jones & Lamson NEW HORIZONS CONTEST, Box 364, Back Bay Annex, Boston 17, Massachusetts.

Entry must be contestant's own, and must be hand-printed or typed on an official Jones & Lamson NEW HORIZONS CONTEST entry form. Entry forms that are not completely filled out will be disqualified. Entry forms filled out in handwriting will also be disqualified. No entries will be returned, and all entries become the property of Jones & Lamson Machine Company.

The submitting of a contest entry implies the contestant's agreement with and submission to all contest rules. Contest entries must be postmarked by midnight July 10, 1956 and received by July 20, 1956.

Board of Judges will include machine tool engineers, production foremen, business executives, trade publication editors, and an engineering college faculty member.

Judges' decisions are final. Entries will be judged for aptness of thought, originality and sincerity. "Literary style", as such, will *not* be a deciding factor. Elaborate or "fancy" entries will receive no extra consideration.

Winners will be announced in Jones & Lamson Machine Company advertisements in trade publications as soon as possible after the judging of the contest.

Easy to Enter! You Could Win!

JONES & LAMSON MACHINE COMPANY
502 Clinton Street, Springfield, Vermont

Please send official NEW HORIZONS CONTEST entry form and information to:

*Name*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

For...

General-Purpose Sawing

with

High Speed

Accuracy, Economy

Model 4B/M2/E2
Equipped with standard
work track
(Optional Equipment).

Let us prove to you the many reasons why this MARVEL Hack Saw offers the cheapest, most accurate and fastest "cut-off" method available to you at a low initial cost.

Ask your dealer, or write us for Bulletin GP35 which fully describes and illustrates the many exclusive features which makes this Hack Saw Machine your "best buy".

MARVEL No. 4B

HIGH SPEED HACK SAW

Exclusive features

1. Horizontal Ball Bearing Saw Frame.
2. Screw Feed—Automatic or Hand Operated.
3. Quick Return Stroke—allows greater number of strokes per minute.
4. Simple Positive Coolant System.
5. Adjustable Stroke—can be shortened for larger capacity.
6. Speed Range—available in 1, 2 or 4 speed models for wider range of work.

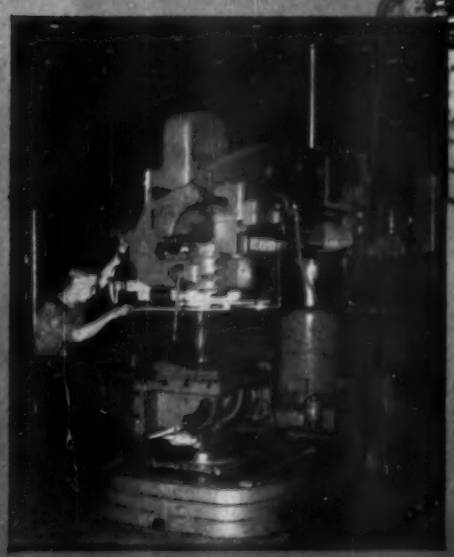
Metal Cutting
MARVEL SAWS
Better Machines–Better Blades

ARMSTRONG-BLUM MFG. CO. • 5700 Bloomingdale Avenue • CHICAGO 39, ILL.

On TOP of his job!

This operator is doing a splendid job at Canadair Limited, Montreal, on the production of F-86E Sabre Jets for the RCAF and, as the illustration shows, he is right on top of his job, too.

He is proud of his fine new 6' 17" column "AMERICAN" Hole Wizard Radial. "It's powerful; it's sturdy; it's easy to operate, and I'm not worn out at the end of the day". What more could any operator ask? As a consequence he turns out a lot of fine work which makes his machine a paying investment for the company.



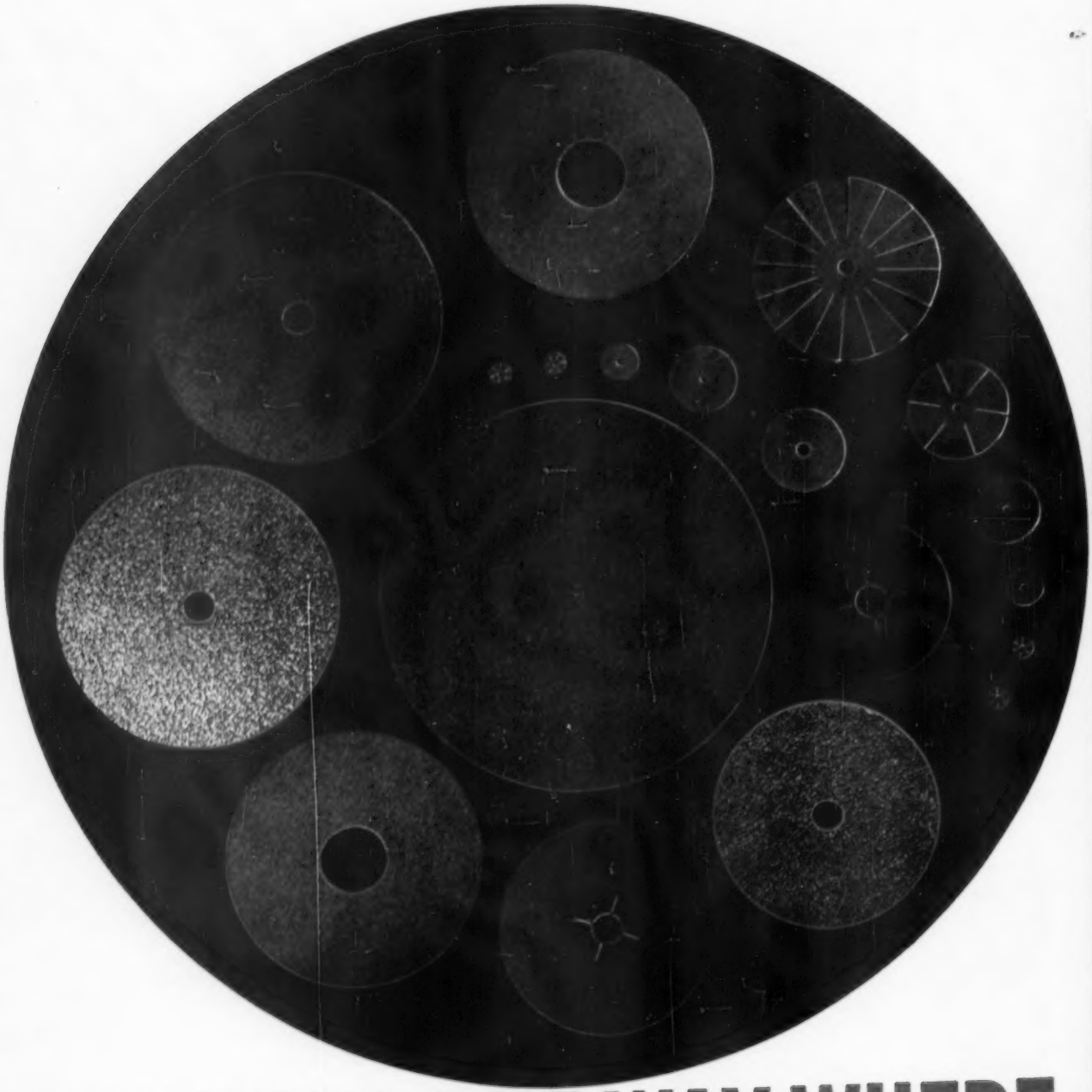
This *"American"* Hole Wizard Radial has a right angle base, on one wing of which is mounted a Bullard Man-Au-Trol Spacer—as shown by the illustration.

"AMERICAN" Hole Wizard Radials are playing a prominent part in the production of critical defense items for both the U. S. A. and Canada.

For a complete revelation of their virtues send for descriptive bulletin No. 327.

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS



TO SMOOTH THE WAY WHERE

JEWEL BRAND GRINDING DISCS

A wider selection of grinding discs especially designed for rapid removal of excess metal as well as for fine finishing of hard or soft metal products is offered in the JEWEL BRAND line.

JEWEL BRAND Grinding Discs are made in all standard diameters and in all degrees of coarseness or fineness with vulcanized fibre, cloth or other backings coated with the world's best abrasive grains. There's a standard or special JEWEL BRAND Grinding Disc to meet every need where the use of an abrasive disc is indicated.

A COMPLETE LINE OF ABRASIVES

Abrasive Products, Inc., manufactures a complete line of JEWEL BRAND coated abrasive products — belts, rolls, sheets, discs, and specialties in a wide variety of shapes and sizes.

MODERN FACILITIES AND MANUFACTURING METHODS

Modern methods and equipment, expert craftsmen, plus carefully controlled grading by the JEWEL triple-screening process, assure uniformly-high standards of quality throughout the JEWEL BRAND line. In the plant of Abrasive Products, Inc., over 250,000 square feet of floor space is devoted to the manufacture of JEWEL BRAND abrasive papers and cloths.

SKILL PLUS WILL

You'll find that AP salesmen not only have the skill to solve problems involving the use of abrasives, but the willingness to continue to search for better ways after problems are solved. Try this combination for best results in the long run.

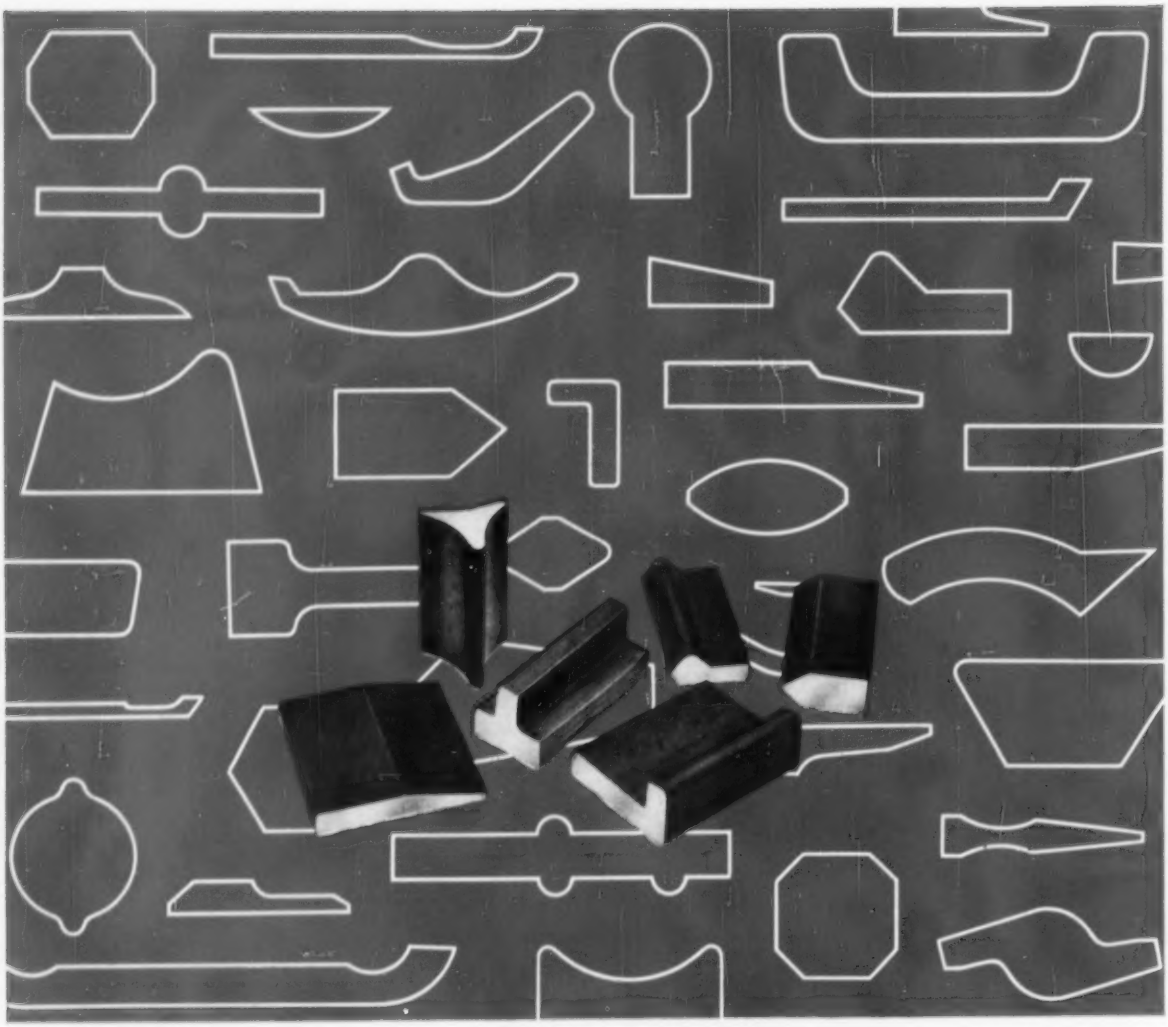
THE GOING IS ROUGH

CALL ABRASIVE PRODUCTS, INC.
South Braintree 85
Massachusetts

JEWEL BRAND
coated abrasives

JEWEL ABRASIVES

JEWELOX • JEWELITE • JEWEL GARNET • NEW PROCESS • JEWEL EMERY • PILGRIM FLINT



Crucible special shapes

for better special steel parts at lower cost . . .

If you're machining intricate sections from solid bars—or using expensive forgings—stop! Choose instead, a *Crucible special shape* that approximates the finished part. *Crucible special shapes* eliminate rough-machining operations . . . reduce scrap losses.

There's practically no limit to the *special shapes* available at Crucible, in a wide variety of special steels. Rolls for over 400 special shapes are available—other shapes can be rolled to your specifications. Your local Crucible representative can give you the whole story of how *special shapes* can cut costs—save time. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

...for piloted taps from stock

SEE YOUR

Threadwell

DISTRIBUTOR

FOR THE FINEST IN
CUTTING TOOLS AND GAGES

Made by THREADWELL, Greenfield, Mass.

Setting speeds and feeds made as easy as tuning a radio . . . so simple any one can pre-set it.

now you can plan and

. . . with the exclusive

Carlton

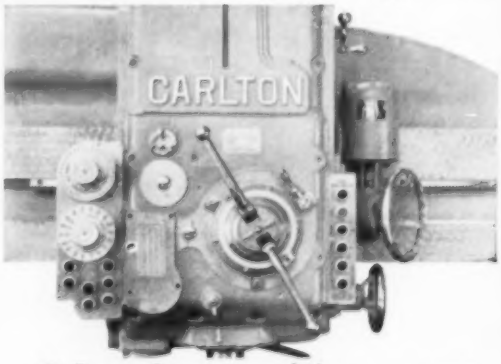
Operator is free to concentrate on starting and stopping spindle, changing cutting tools . . . speeds and feeds have all been pre-set.

The exclusive Carlton programming and preselector systems open up a whole new technique of hole drilling production.

Programming Here's how the Carlton-Leber programming works: your production engineering department studies the workpiece drawing and determines the sequence of drilling operations and the correct speed and feed for each. This data is recorded on a routing sheet or blueprint

Carlton Radial Drills now come with your choice of 3 different

1 ***Manual gear shift:*** 2 shifter levers for controlling speeds, 2 shifter levers for controlling feeds.



2 ***Pre-select gear shift:*** 1 speed graduated dial and 1 feed graduated dial pre-set speeds and feeds.

pre-set speeds and feeds for an entire drilling program

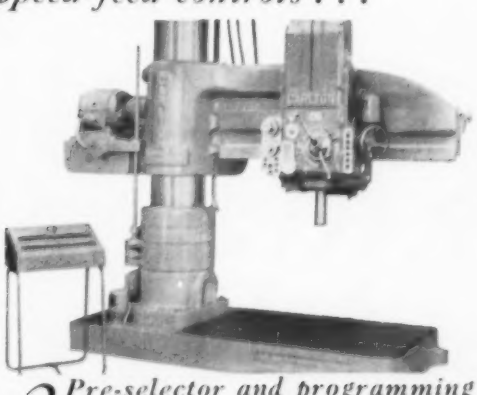
programming

and is transferred to the programming console. The programming console contains an indexing dial which shows the operation sequence number being performed. Operator has local control and can perform operations out of sequence by manually advancing or reversing the indexing dial.

Pre-selector For less lengthy or complicated drilling jobs, the programming unit can be disconnected through a selector switch and the pre-selector then becomes operative. The pre-selector saves time by allowing operator to select the speed and feed for the next operation while the machine is under cut. Pre-selector may be furnished with or without the programming unit. In fact, you can now buy your Carlton radial drill with your choice of one of three different types of speed-feed control as illustrated below.

You can see the pre-selector and programmer in operation. Ask your Carlton distributor to arrange a showing of the new Carlton movie. Or, write us direct for descriptive free bulletin. The Carlton Machine Tool Co., Cincinnati 25, Ohio, U.S.A.

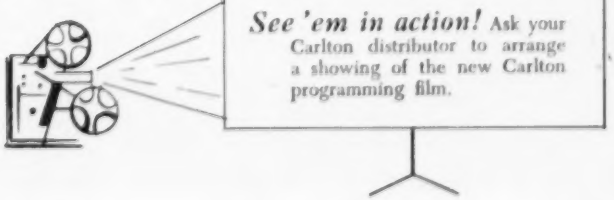
speed-feed controls . . .



3 ***Pre-selector and programming gear shift*** sets up correct speeds and feeds for a complete sequence of operations.

Carlton

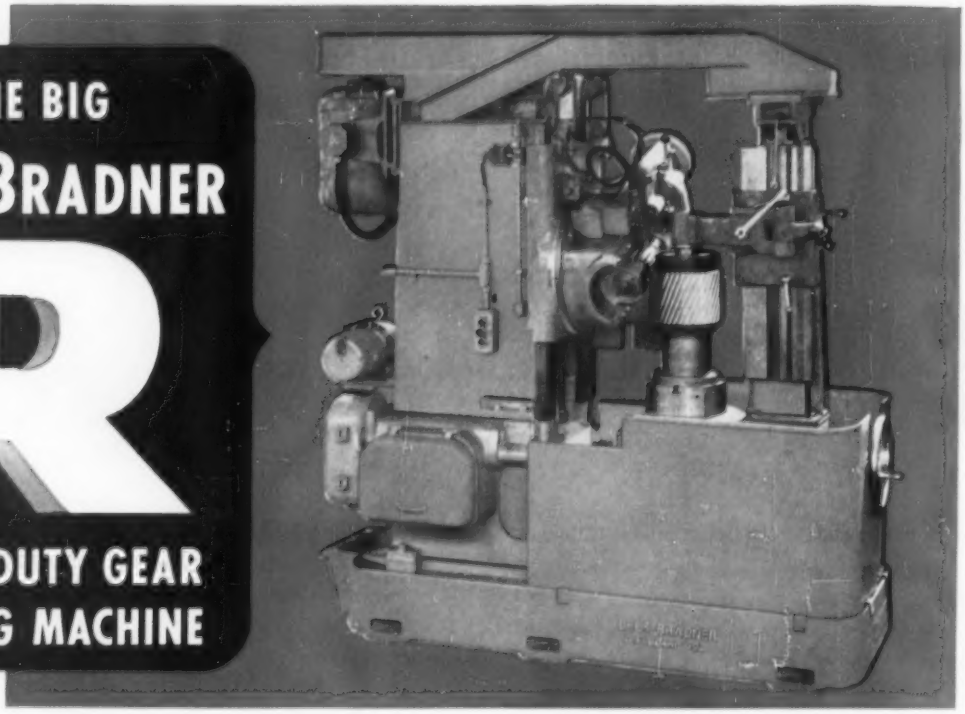
horizontal and radial drills



Extra Rugged...

For The ROUGH Hobbing Jobs!

THE BIG
LEES-BRADNER
R
HEAVY-DUTY GEAR
HOBBING MACHINE



Built rugged and reliable to handle those rough, tough gear hobbing jobs . . . that's the new Lees-Bradner Model "R".

It's designed to hob spur or helical gears up to 1¼ DP with a left or right hand maximum helix of 45°.

The Model "R" features fast loading and unloading, ready access to index and feed change plus easy operation and maintenance.

Write for your free brochure giving the detailed capacities and specifications of this new heavy-weight hobbing machine.

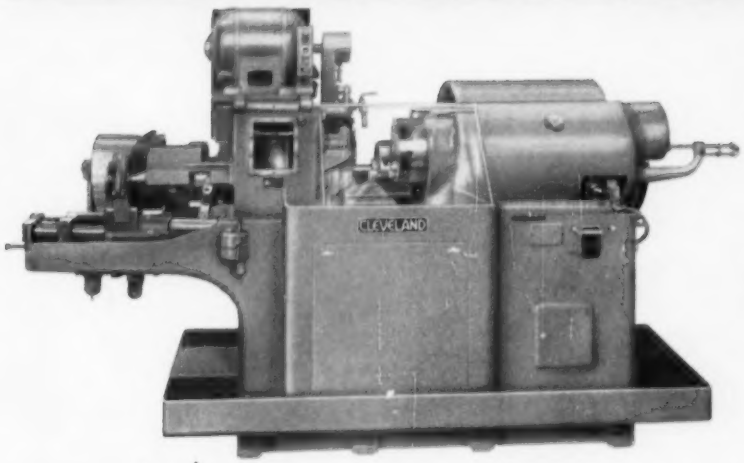
SPECIFICATIONS

Maximum outside diameter with tailstock column	16"
without tailstock column	18"
Minimum C/D hob to work	1¼"
Maximum C/D hob to work	12"
Travel	18"
Maximum diameter of hob (3-1, 6-1, or 12-1 backgearing)	10" x 10"
DP range	1¼ DP to 16 DP
Maximum manual (or electric) shift of hob	6"
Diameter of hole through work spindle	2"
Machine weight	13,000 lbs.

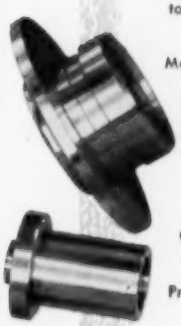
the **LEES-BRADNER** *Company*

CLEVELAND 11, OHIO • U.S.A.

new CLEVELAND
2½" MODEL "AW" SINGLE SPINDLE AUTOMATIC



Several examples of typical Model "AW" production are shown here. Note the profitable production rates—the variety of operations performed with simple tooling.



Material: 24ST Aluminum
Operations: Drill (2); C'bore; Ream; Face; Form (2); Cut-off.
Production: 62 pieces/hr.

Material: SAE 2317
Operations: Drill (2); C'bore; Tap; Face; Form (2); Cut-off.
Production: 41 pieces/hr.

Material: FM Brass
Operations: Drill (2); Thread; Bore; Form; Knurl; Cut-off.
Production: 110 pieces/hr.

Material: SAE 4615
Operations: Turn; Form (2); Thread; Center; Face; Chamfer; Cut-off.
Production: 36 pieces/hr.

Material: 24ST Aluminum
Operations: Drill (2); C'bore; Chamfer; Face (2); Form (2); Cut-off.
Production: 80 pieces/hr.

CUTS YOUR COSTS 3 WAYS!

More than 65 years of automatic screw machine design experience has been engineered into this new Model "AW" Cleveland. Its many modern features will enable your shop to set new economy records for fast, accurate production of turned and formed parts . . . *and you save three ways:*

YOU SAVE ON BASE PRICE

Your savings start at the *first* cost, as the 2½" Model "AW" is offered at a base price of $3500 to $4000 *less* than other comparable automatics!

YOU SAVE ON SET-UP TIME

Such features as universal camming . . . rapid hand crank stock feed adjustment . . . quick change collet pads . . . maximum accessibility for tooling . . . make this Cleveland *quick* to set-up and exceptionally economical to operate. Spindle speeds range from 69 to 1920 rpm, providing efficient cutting speeds for all types of materials and tools. Four full automatic speed changes are available. Gear changes are quickly made.

YOU SAVE ON MAINTENANCE AND FREEDOM FROM DOWNTIME

Simplicity is the keynote of this Cleveland design. Completely free from complex mechanism and controls requiring constant attention or adjustments, this rugged, *fool-proof* automatic will assure the user dependable day-in, day-out performance!

To find out how much this new Cleveland can save you on your parts production, ask your Cleveland representative to submit a cost proposal with production estimates based on prints or samples of your work. There is no obligation.

Write for this new bulletin for full details on the 2½" Model "AW" Cleveland

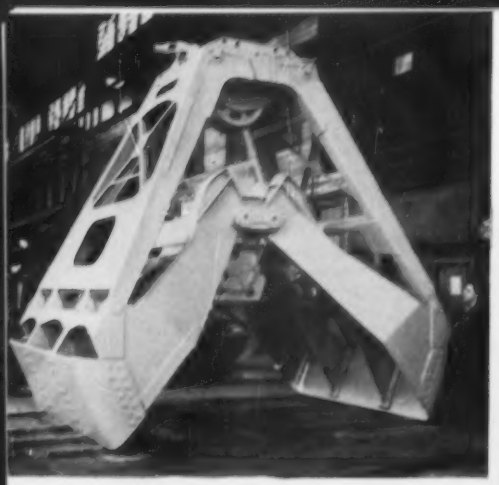
Remember: *Clevelands Cut Costs*

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • S. ORANGE

In ore clean-up buckets . . .



HALF AS THICK! In the trays for giant ore clean-up buckets, 1¼" USS "T-1" Steel Plate, with a yield strength of 90,000 psi., replaces cast trays which were as much as 2½" thick. The new buckets—lighter in weight by more than half a ton—and expected to outperform the heavy cast trays, will be used at United States Steel's South Works.

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS "T-1" CONSTRUCTIONAL ALLOY STEEL

FABRICATION SIMPLIFIED WITH USS "T-1" STEEL

(plus weight reduction of more than ½ ton)

The trays of ore clean-up buckets must have phenomenal shock and abrasion resistance to hold up under constant scraping and scouring along the steel bottoms of ore boats. They are commonly made of heavy steel castings. But recently, Blaw-Knox Company, Pittsburgh, Pa., *fabricated* trays for several new buckets from USS "T-1" Steel Plate. This amazing new alloy steel assures the needed strength and durability, plus important fabricating advantages.

LESS WEIGHT—LESS EXPENSE

Biggest single advantage of fabricating from USS "T-1" Steel Plate is less weight. New trays weigh only 4,021 pounds each, compared to 5,068 pounds for comparable cast manganese steel trays. Thus, USS "T-1" Steel decreases the weight of the bucket and reduces shipping and handling costs.

What's more, fabrication from USS "T-1" Steel simplified the building of these huge buckets. It eliminated the expensive patterns needed for cast trays. Because USS "T-1" Steel has tremendous resistance to impact abuse and abrasion, it is expected that it will outperform previously used materials.

For these ore buckets, USS "T-1" Steel is flame-cut to size, *cold formed* in a 1,250-ton press, drilled and then riveted to the bucket shell. USS "T-1" also can be welded—without pre- or post-heating. Because of its unusual combination of properties, it is cutting costs in many rugged applications.

LOOK AROUND YOUR SHOP

In your own equipment, or in the products you make for others—wherever you would like to increase service life . . . wherever you would like to reduce fabricating costs of heavy-duty parts—look into the possibility of using USS "T-1" Steel. Competent technical advice is always available, of course — free of charge — from United States Steel. Write, wire, or phone for complete information. United States Steel, Room 5207, Pittsburgh 30, Pa.

See "THE UNITED STATES STEEL HOUR"—Televised alternate weeks—Consult your newspaper for time and station.

UNITED STATES STEEL

TISHOLT

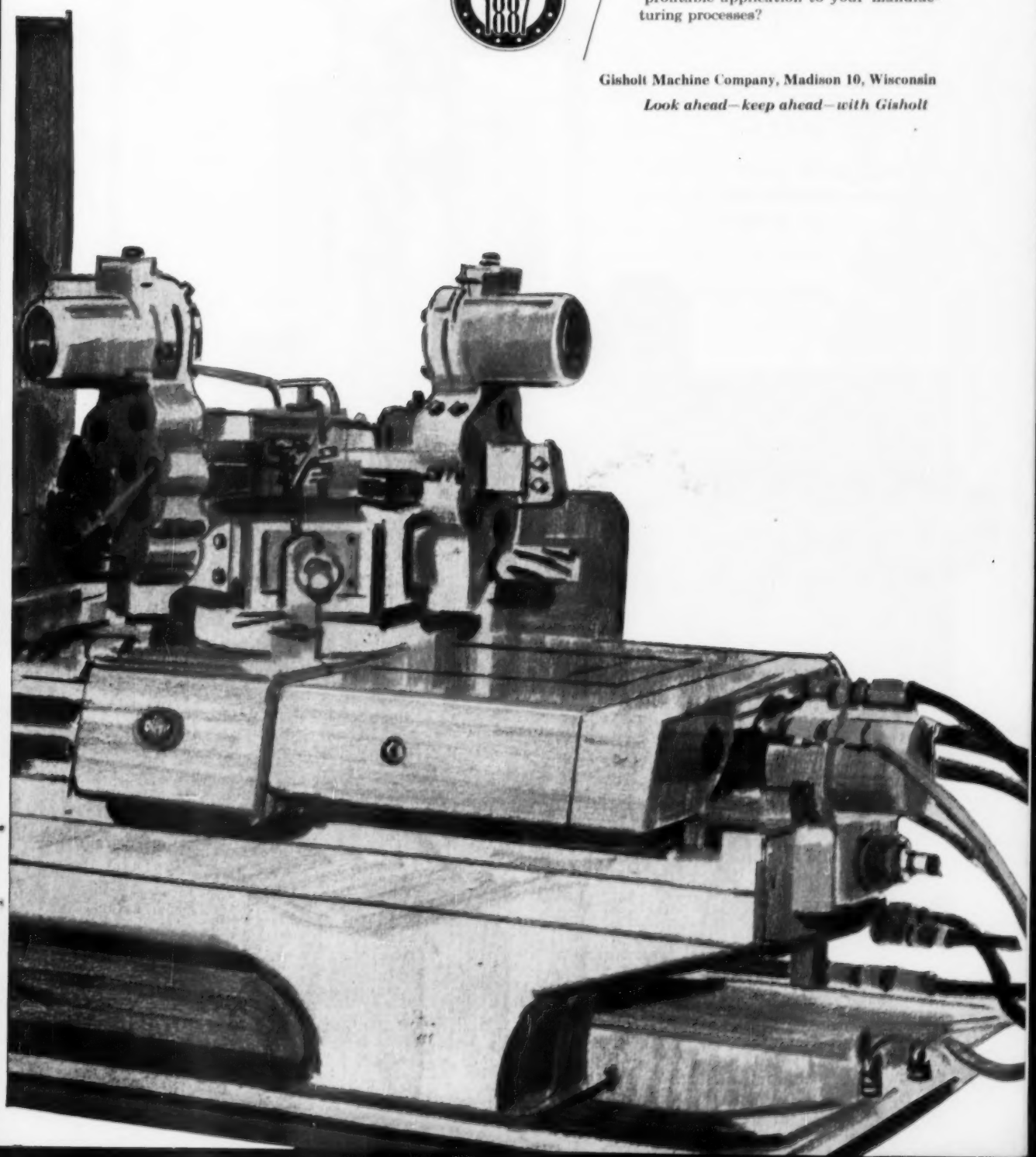
GISHOLT MASTERLINE FASTERMATIC AUTOMATIC TURRET LATHE

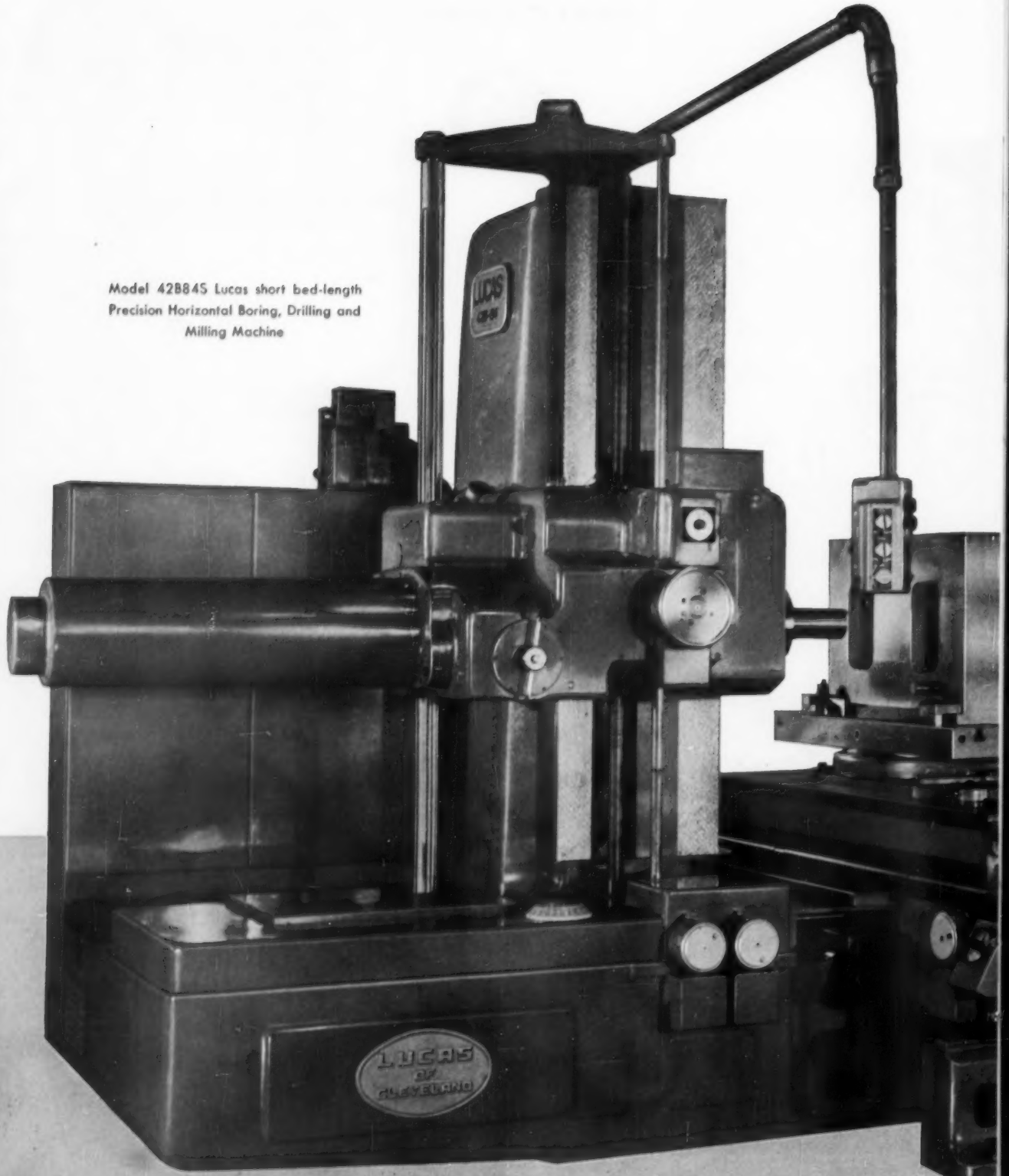
MASTERLINE
GISHOLT SINCE 1887

This latest design Gisholt MASTERLINE Fastermatic Automatic Turret Lathe offers many outstanding features which give you faster, easier operation, higher quality work, quicker setup and lower maintenance. In short, this machine will do your work faster and better at less cost—and with a new minimum requirement for operator skill, effort and attention. May we give you more facts about its profitable application to your manufacturing processes?

Gisholt Machine Company, Madison 10, Wisconsin

Look ahead—keep ahead—with Gisholt

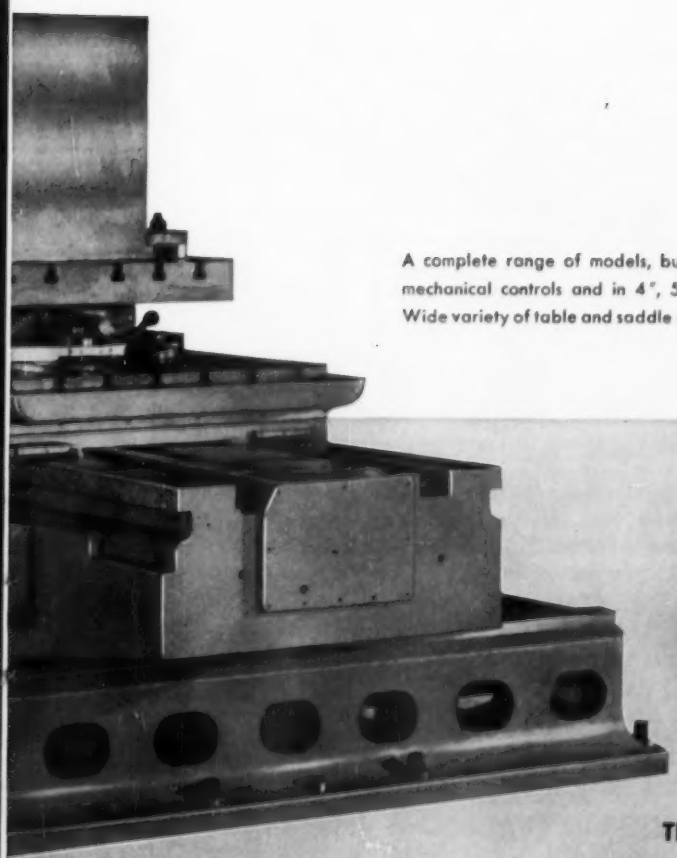




Model 428845 Lucas short bed-length Precision Horizontal Boring, Drilling and Milling Machine

more Lucas in less space

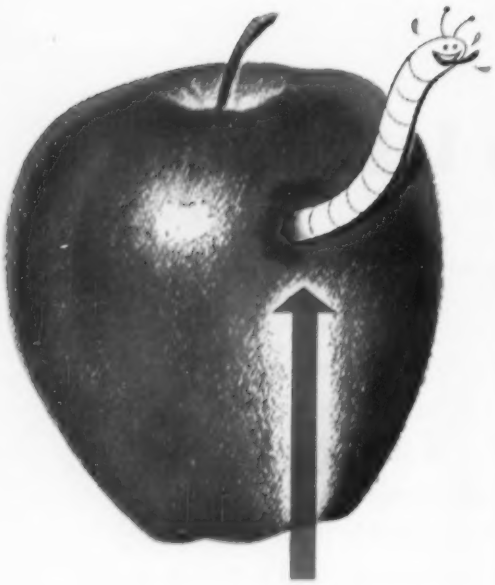
This new horizontal boring, drilling and milling machine is a space and money saver on work where a backrest is not required. Lucas leads the parade by concentrating all its efforts on horizontal boring machines—by constant improvement, by incorporating every advance immediately. Every worthwhile improvement will be found first in a Lucas. Lucas Machine Division • The New Britain Machine Company, 12302 Kirby Ave., Cleveland 8, Ohio.



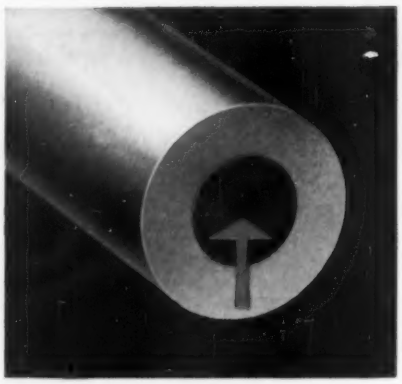
A complete range of models, built in 3", 4" and 5" spindle sizes with mechanical controls and in 4", 5" and 6" sizes with electrical controls. Wide variety of table and saddle sizes with two- or four-way beds optional.

LUCAS
OF
CLEVELAND

A DIVISION OF
THE NEW BRITAIN MACHINE COMPANY



a hole here makes waste...



a hole here saves waste

Crucible Hollow Tool Steels save waste — time and money — whenever you need ring-shaped parts or tools with a center hole. For the hole is in the piece when you get it! You eliminate drilling, boring, rough-facing operations — save machine capacity for productive work.

And you can get Crucible Hollow Tool Steels in *any* of our famous tool steel grades . . . in bar lengths or saw cut to your individual requirements. They are made in practically any combination of O.D. and I.D. sizes. What's more, delivery is *immediate* with Crucible's popular KETOS oil-hardening, SANDERSON water-hardening, AIRDI 150 high-carbon high-chromium, AIRKOOL air-hardening, and NU DIE V hot work tool steel grades from warehouse stocks.

Next time you have an application with a center hole, let your Crucible representative show you how these hollow tool steel bars can save you money and time. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Canadian Distributor — Railway & Power Engineering Corp., Ltd.

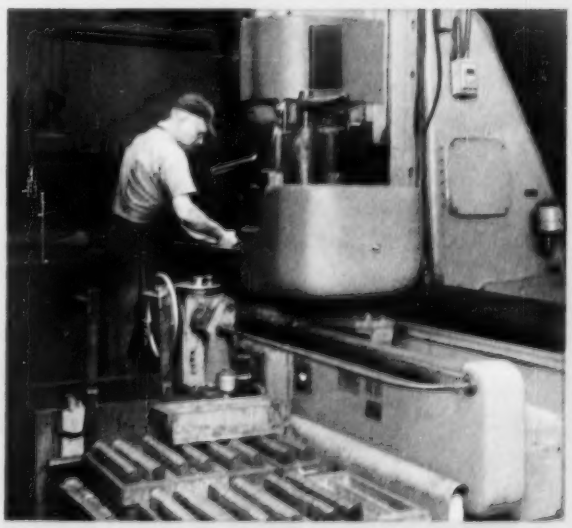
MATTISON
HIGH-POWERED
PRECISION

IF IT'S A FLAT SURFACE
THERE'S A MATTISON
TO GRIND IT!

GRINDING METHODS

Save setup time and machine time edge grinding on the Mattison No. 300

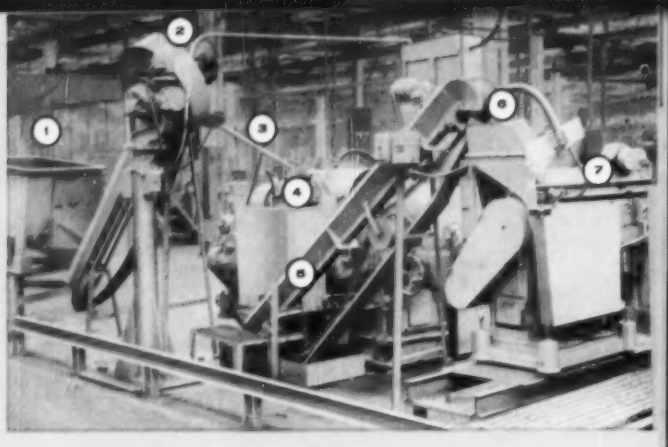
Mattison Model 300 Vertical Spindle Surface Grinders slashed setup time from 9 manhours to ½ manhour, and now *four* machines do the work of *eight* at this tool manufacturer's plant. Hardened blades for carpenter planes are ground at a rate of 1750 per hour with a definite increase in accuracy, drastic reduction in maintenance costs, and reduction in grinding wheel costs. Mattison Vertical Spindle Grinders are designed for the accurate generation of flat surfaces. Fine increment feeds and close limits of accuracy are possible because the wide, extra-heavy vertical column is one solid piece, bolted to the base. Flat and vee column ways are longer, wider, and thicker, thus preventing any binding of the head slide. Send for Bulletin No. 847.

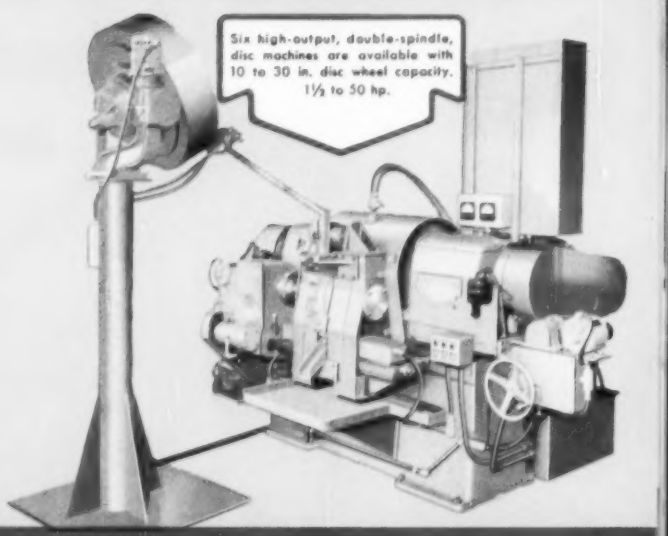


Positive cutting action and high

Standard machine meets automatic requirements . . . grinds more than 1300 pins per hour, both ends

Automatic operation of this Mattison No. 221 Double-Spindle Disc Grinder machines both ends of piston pins for six and eight cylinder car and truck engines at a rate in excess of 1300 pieces per hour. Installed in a large automotive plant, this accurate, high-output grinder keeps ahead of the production line as automatic loading and sizing devices call for minimum attention from the operator. These sizing devices gauge the work continuously. When grinding wheels wear so that pins approach the high limit of tolerance, the automatic feed is actuated to compensate for wear. Tolerances are consistently within specifications, and finish is 20 micro inch. Numbers on the illustration will help you trace sequence of operations: 1) hopper for rough pins; 2) stacking drum which aligns pins; 3) conveyor carrying pins into grinder; 4) grinding station (both ends finished at once); 5) belt conveyor; 6) loading hopper for next operation; 7) conveyor for lining pins end to end for centerless grinding of outside diameter. These versatile double-spindle disc grinders may solve a production problem for you. Send for Bulletin No. 647. (No. 221 Double-Spindle Disc Grinder).





Six high-output, double-spindle, disc machines are available with 10 to 30 in. disc wheel capacity. 1½ to 50 hp.

SELECT THE RIGHT GRINDER FOR YOUR JOB FROM MATTISON'S COMPLETE LINE OF

$3640 saved yearly by refinishing forging dies on Mattison 100 hp Surface Grinder

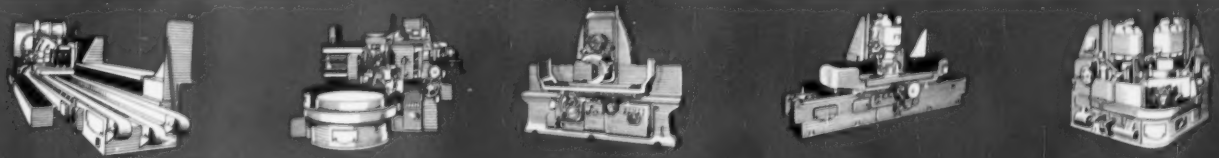
Heavy stock removal from these dies demands the high horsepower built into every Mattison.

Positive cutting action and high precision of Mattison Surface Grinder cuts costs for tool and die shop

MATTISON
HIGH-POWERED PRECISION
GRINDING METHODS

Another tool and die shop reports excellent results with Mattison High-Powered Precision Surface Grinders. Installation of the first Mattison led to the purchase of the second, as it does so often. Versatility of the grinders, combined with ease of setup and precision performance, makes them ideal for the tool and die shop.

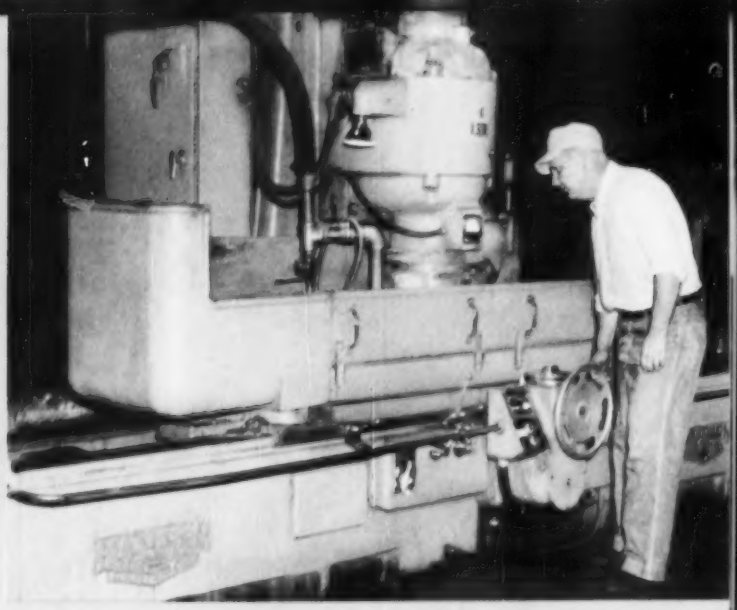
This user has discovered that improving the grinding operation has been equivalent to increasing productive capacity of the shop. With today's high volume of sub-contract work, including tool and die work, machine parts, and production jobs, the Mattison may be the answer to your problem of increasing capacity and profits. Send for a copy of "Setups," a book which describes the great variety of profitable work you can do on a Mattison. You will find this book extremely helpful in planning future work.



60 DIFFERENT MACHINES • SURFACE GRINDERS • FACE GRINDERS • DISC GRINDERS

Savings of $3640 in labor costs annually convinced this Mattison user of the wisdom of installing a Mattison Model 400SS Vertical-Spindle Surface Grinder for refinishing drop hammer forging dies used to work nickel alloy ingots into blooms, billets, or slabs. These tough nickel-chrome-molybdenum dies were formerly reworked on the planer where two dies could be machined simultaneously, with two changes in setup to finish the beveled corners. Highest production rate was four blocks per shift with grinding needed to remove tool marks. The Mattison has replaced the planer and increased production to an average output of seven die blocks per shift. Holding fixture allows beveled edges to be ground easily by tilting the die. Send for Bulletin No. 847.

Ease of operation cuts production costs 15% . . . high power removes stock 20% faster

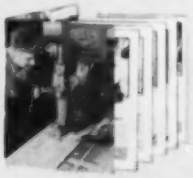


High speed tool bits are ground to tolerances of +.0005 in.

Production cost savings of 15 per cent through ease of operation are reported by this Mattison user. A Mattison Model 300 Vertical-Spindle Surface Grinder has the power to remove metal 20 per cent faster in the plant of a large manufacturer of tool steel products. This machine consistently meets precision requirements for tolerance and parallelism, and costs very little to maintain. Accuracy is assured on the Mattison 300 because of its rigid, one-piece column design, high horsepower, and built-in motor whose special shaft is the grinding wheel spindle. This spindle holds its adjustment, yet can be positioned quickly and accurately for the individual job. Exclusive Universal adjustment head slide mounting adds flexibility for handling a greater variety of work. Send for Bulletin No. 847.

IF IT'S A FLAT SURFACE . . . THERE'S A MATTISON TO GRIND IT!

New Surface Grinding Case Histories...



now available!

Mattison brings you authentic user reports demonstrating the versatility of surface grinding—newest method of metal cutting. High production with extreme precision are twin qualities to be found in almost every story. Many different products and materials are described in these reports.

Attach this coupon to your letterhead, and mail today!

SEND . . . me my copy of

- "Surface Grinding Case Histories" ☐
- I would like the following bulletins: Bulletin No. 847 ☐
- (Model 300 and 400 SS Vertical-Spindle Surface Grinder) ☐
- Bulletin No. 647 (No. 221 Double-Spindle Disc Grinder) ☐
- "Setups" (Surface grinder job descriptions) ☐

Name _____

Title _____

Company _____

Address _____

City _____ Zone _____ State _____

MATTISON MACHINE WORKS ROCKFORD ILL. U.S.A.

HIGH-POWERED PRECISION SURFACE GRINDERS

MATTISON MACHINE WORKS

ROCKFORD, ILLINOIS

The 9" dia. column 3' arm Cincinnati Super Service Radial is working on chassis frame parts and aluminum steering column brackets; ¼" dia. to 1¼" holes drilled and reamed to a .0015" tolerance.

The Upright Drill shown is one of six 28" Super Service Uprights working on heat treated alloy steel frames.

Money-making Cincinnati Bickford machines ... at The Autocar Division, WHITE MOTOR CO. —EXTON, PA.

Photos courtesy the Autocar Division of The White Motor Company, Exton, Pennsylvania.

Speed and easy handling—power and accurate, steady performance were factors in the selection of Cincinnati Bickford Super Service Radial and Upright Drills in this plant. They are quickly adaptable to a variety of operations, including drilling, reaming, tapping and trepanning.

For rapid, accurate, dependable production investigate these cost reducing modern drilling machines.

Write for Bulletin R21C.

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

CINCINNATI BICKFORD DIVISION

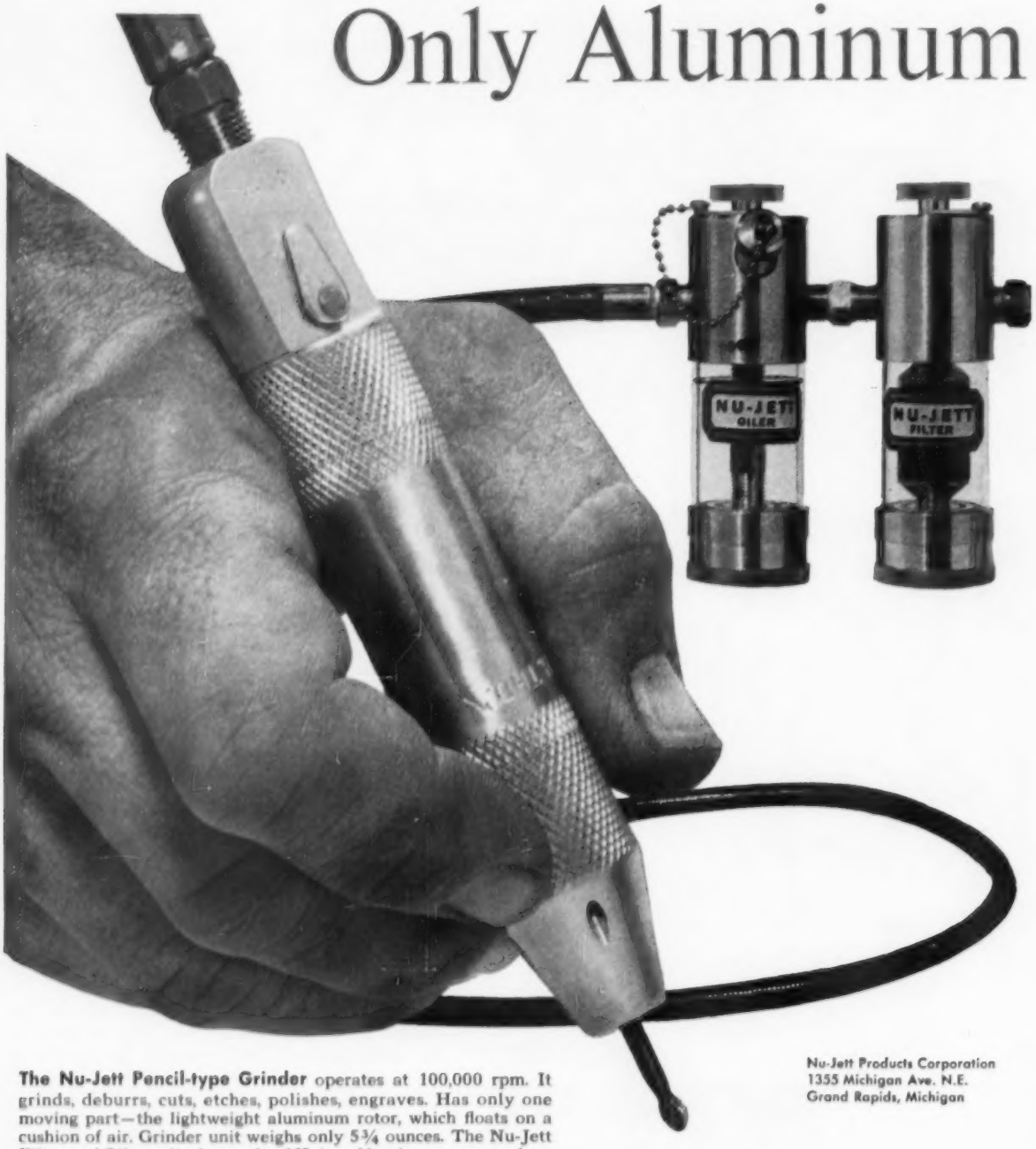
Cincinnati 9, Ohio, U.S.A.

GIDDINGS & LEWIS MACHINE TOOL CO. : Fond Du Lac, Wisconsin

City Zone State

ROCKFORD, ILLINOIS

Only Aluminum



The Nu-Jett Pencil-type Grinder operates at 100,000 rpm. It grinds, deburrs, cuts, etches, polishes, engraves. Has only one moving part—the lightweight aluminum rotor, which floats on a cushion of air. Grinder unit weighs only 5¾ ounces. The Nu-Jett Filter and Oiler unit, also made of Kaiser Aluminum, assures clean air for the grinder, simultaneously with accurately metered oil in mist form. Units are perfect example of how Kaiser Aluminum makes possible high quality, precision products at reasonable cost.

Nu-Jett Products Corporation
1355 Michigan Ave. N.E.
Grand Rapids, Michigan

GENERAL MANAGER OF NU-JETT, Mr. William W. Peterson, says:

"Aluminum saved us 27% in costs! Aluminum's lower initial cost was a big factor in this saving. But it also provided other important savings. Its light weight gives us appreciable savings in shipping costs, including the lighter weight shipping container. Brass would have required a clear baked enamel for protection. Steel could not be considered for this product because compressed air, which runs the tool, carries moisture which would quickly rust the metal.

"One more thing: machined aluminum gives the Nu-Jett grinder a quality that puts it in a class by itself."

parts are good enough for this amazing grinder!

BECAUSE of the high performance and quality requirements of the Nu-Jett pencil-type grinder, made by the Nu-Jett Products Corporation, Grand Rapids, Michigan, *only* aluminum screw machine parts could be successfully used.

Nu-Jett found that Kaiser Aluminum was the perfect material for their grinder and filter unit. It was not only economical in raw material outlay and production costs but actually *permitted a design of higher performance characteristics!*

DESIGN ENGINEER OF NU-JETT, Mr. Charles V. Johnson, says:

"Aluminum made this grinder possible! Obviously, a pencil-type grinder that has a speed of 100,000 rpm and yet is extremely durable makes metal selection of paramount importance. In every way, aluminum was superior to other metals. The light weight aluminum rotor attains maximum rpm within 4 seconds, thus minimizes starting lag. Too much lag would result in the rotor turning in the critical vibration zone long enough to cause excessive wear on the bearings. Once started, the light aluminum rotor actually floats in the air stream. By using aluminum for virtually every part, we make the tool easy to use, with less operator fatigue.

"Aluminum's anodic finish is more resistant to the attack of salt-laden hand moisture. These, of course, are only a few of the many rewarding design experiences we have had with Kaiser Aluminum."

SCREW MACHINE FOREMAN AT NU-JETT, Mr. Arthur Moorhus, says:

"Aluminum speeds our production! In the first place, we have no difficulty in machining aluminum at the same speeds and feeds as brass, and often faster. We use conventional tools and tool angles for aluminum. It's easier to handle and feed into the Automatics because it's so much lighter. We find that *Kaiser* Aluminum Rod runs extremely uniform and we like it as well as any other metal to machine."

THE Nu-Jett story is just one of many that emphasize this point: *you can recommend aluminum parts with confidence.*

This can mean more business for you because you can usually offer a *lower bid* in aluminum, often with better quality. Even when specifications call for another material you should always offer a bid in aluminum.

Remember that you get *three times* as many parts from a pound of Kaiser Aluminum stock as from a pound of brass or steel. That's why each part can cost far less!

In addition, Kaiser Aluminum stock often permits other important economies that help you offer lower bids: It eliminates expensive plating. It extends tool life. It reduces cleaning costs, because lightweight aluminum chips easily "float" from cavities. And its light weight greatly reduces shipping charges and cuts the cost of material and process handling.

For more information or assistance, look for our local number in the classified telephone directory under the heading "Aluminum" or contact one of our many distributors. Kaiser Aluminum & Chemical Sales, Inc. *General Sales Office,* Palmolive Bldg., Chicago 11, Illinois; *Executive Office,* Kaiser Bldg., Oakland 12, California.

Kaiser Aluminum

setting the pace—in growth, quality and service

P&H Welding Positioners offer these

9 BIG ADVANTAGES

Exclusive P&H features make welding easier, safer, more efficient . . . improve quality and reduce costs

1. Greater Flexibility. P&H Positioners have plus clearance when face plate is tilted 135°. You can handle larger weldments.

2. Positive Safety. P&H Positioners have an exclusive locking feature which prevents table from falling, and all gearing is completely covered.

3. Greater Elevating Range. You get more working range on table heights with P&H Positioners, even on smaller models.

4. Choice of Mounting. Only P&H Positioners offer you a choice between floor-pit or portable mounting. You select the mounting that will serve you best.

5. Power Elevation. You get reliable power elevation even with capacity loads.

6. Largest Selection. There are 27 P&H Positioner models to choose from, to meet your exact needs — capacities from 500 pounds to 100,000 pounds.

7. 135° Tilt. Every P&H Positioner gives you a full 135° tilt, in a design that provides full clearance at maximum tilt — and complete safety.

8. Stronger Construction. There's more steel in P&H Positioners than in other positioners — for extra strength.

9. Working Parts Covered. P&H Positioners have longer life because all working parts are concealed and protected from interference by dust, debris, and splatterings.

HARNISCHFEGER
MILWAUKEE 46, WISCONSIN

I'M SMOOTH-ARC SCOTTY... reminding you that downhand position welding can save you from 17 to 53% in costs. One firm has saved 70%.

P&H WP-3 POSITIONER — 27 models to choose from — 500 to 100,000 pounds capacity.

SEND COUPON *today!* FOR MORE INFORMATION

P&H

HARNISCHFEGER CORPORATION
Welding Division
4514 West National Avenue, Milwaukee 46, Wis.

Attention: Mr. W. R. Stephens, Sales Manager

Please send me more information on P&H Welding Positioners.

Name ..... Title .....

Company .....

Company Address .....

City ..... Zone ..... State .....

3064

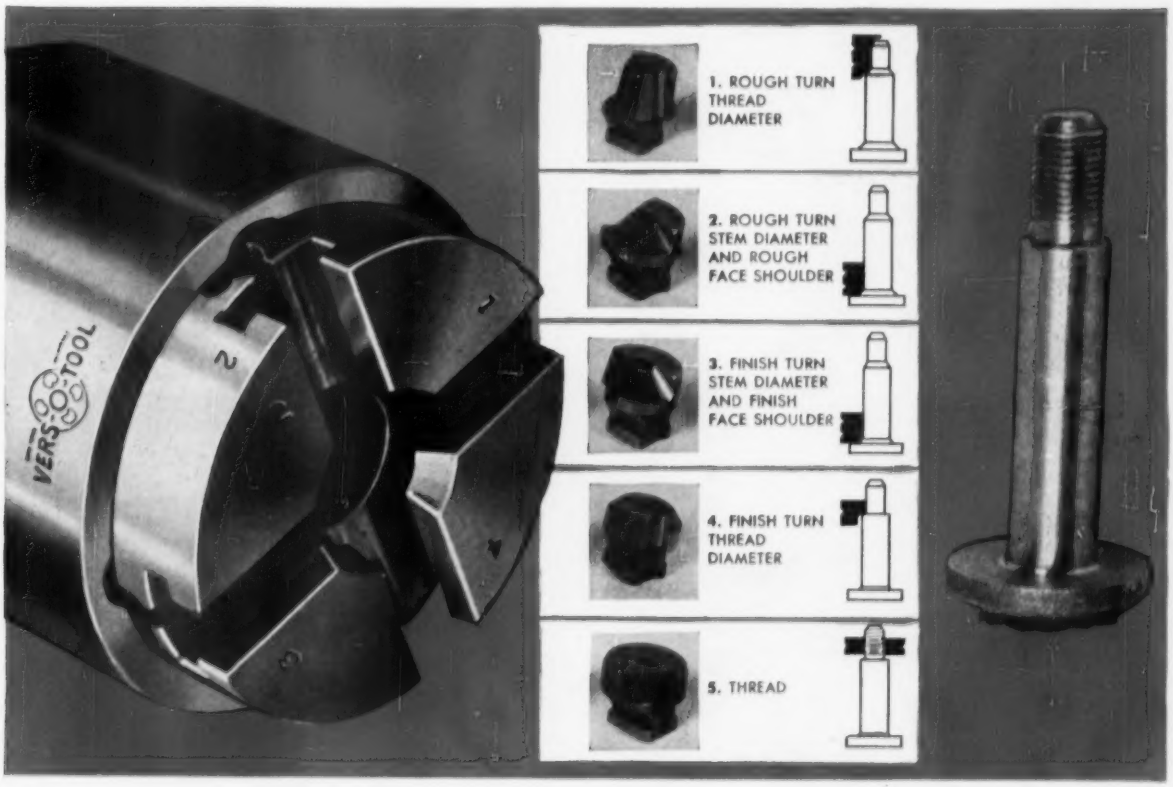
the P&H *Line*

P&H welding equipment is manufactured and sold in Canada by REGENT EQUIPMENT MANUFACTURING COMPANY LTD., 455 King Street West • Toronto, Ontario, Canada

HERE'S HOW NAMCO VERS-O-TOOL

CUTS COSTS... SPEEDS PRODUCTION ON END TURNING AND FORMING

In this application 300 lever supports an hour are turned out on a vertical six-spindle automatic. Vers-O-Tool machines these steel forgings three times faster than single point tools, opens at the end of the cut, leaves no spiral marks on the work.


VERS-O-TOOL
1. ROUGH TURN THREAD DIAMETER
2. ROUGH TURN STEM DIAMETER AND ROUGH FACE SHOULDER
3. FINISH TURN STEM DIAMETER AND FINISH FACE SHOULDER
4. FINISH TURN THREAD DIAMETER
5. THREAD

Vers-O-Tool licks tough production problems because:

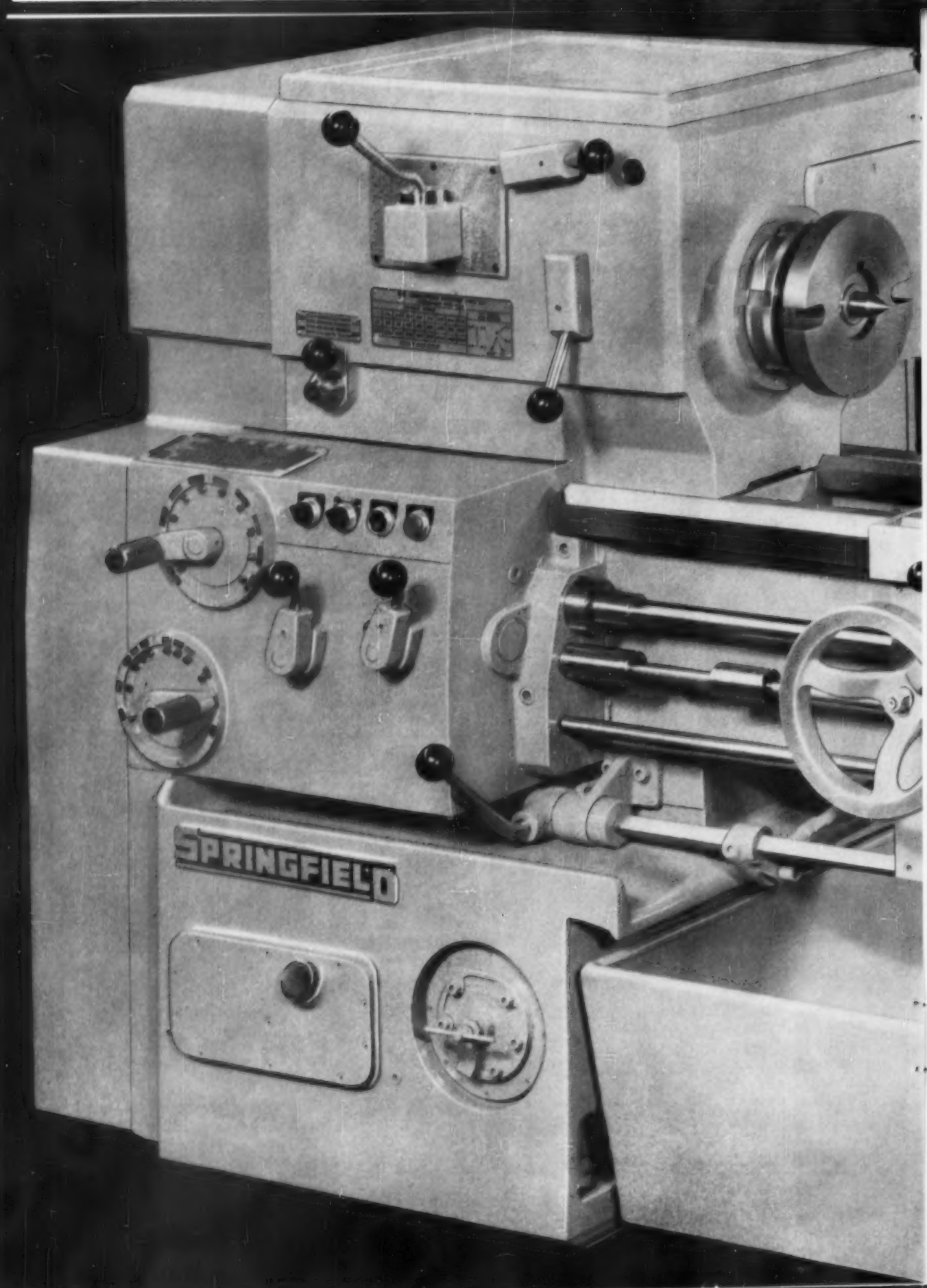
1 Basic Vers-O-Tool design permits cutters or ground thread chasers to be changed quickly without adjustment in the head.

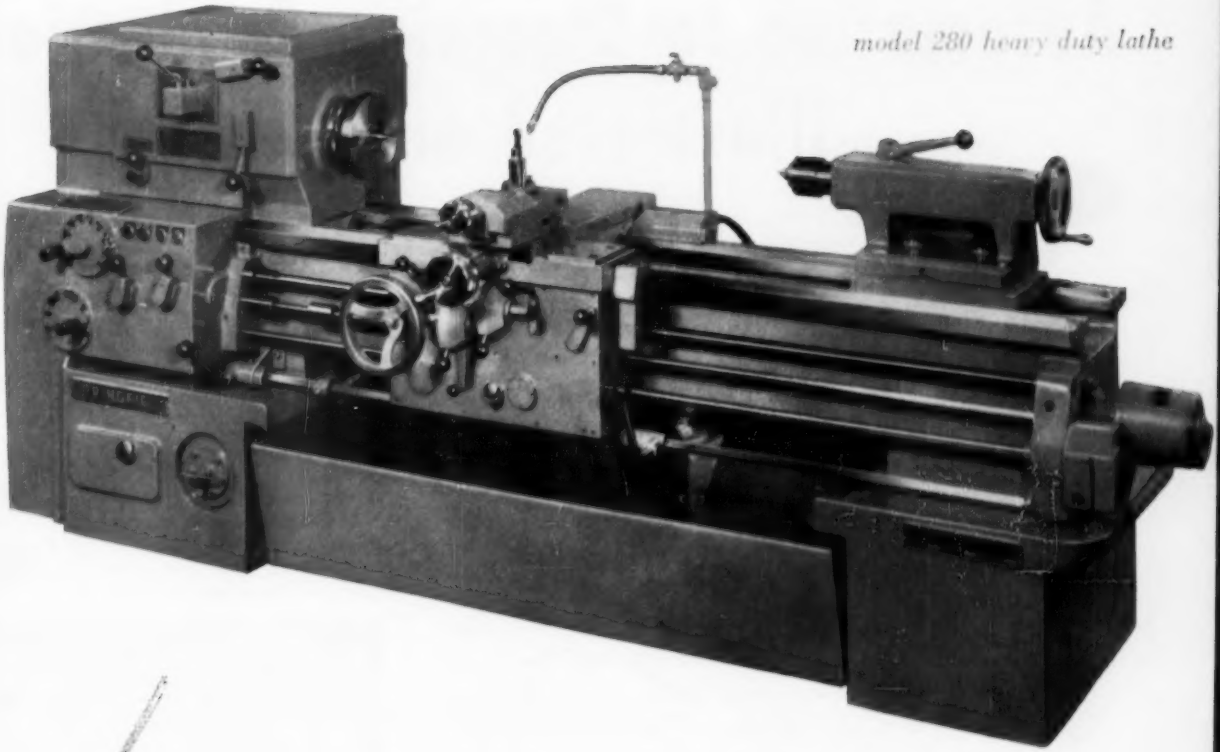
2 All settings in the blocks are made in the tool-room with a micrometer gauge—no need for trial and error run after changing or grinding.

SEND FOR THIS CATALOG DT-52

the National Acme company

171 EAST 131ST STREET • CLEVELAND 8, OHIO


SPRINGFIELD



model 280 heavy duty lathe

it does more work for less money

Springfield is proud to present a new heavy-duty 16″ engine lathe, the Model 280. It offers high horsepower—10, 15 or 20 hp—for heavy cuts, clean design, and ease of operation, all at a reasonable price. Direct simplicity and straightforward design assure low maintenance cost.

It has no electronic brain, because Springfield believes that most of today's jobs still require craftsmanship of the human variety. In the Model 280 the price is for the tool, not the brain.

Only the gears necessary for a given speed are in mesh. Sixteen speeds to choose from, 60 feeds and threads—available instantly to any operator. Unique sealed oil spray lubricates and cools gears. It's the lathe most easily converted to contouring and reproducing with accessories, without budget strain. If you're in the quality market for a new heavy-duty lathe that still respects the contribution of craftsmanship, the Model 280 is for you. Basic price FOB Springfield, Ohio, $8,013.

The Springfield Machine Tool Company
Springfield, Ohio

65TH YEAR OF BUILDING IDEAS INTO MACHINE TOOLS

SPRINGFIELD

Automation in Stamping Production Illustrated on the U.S. MULTI-SLIDE®

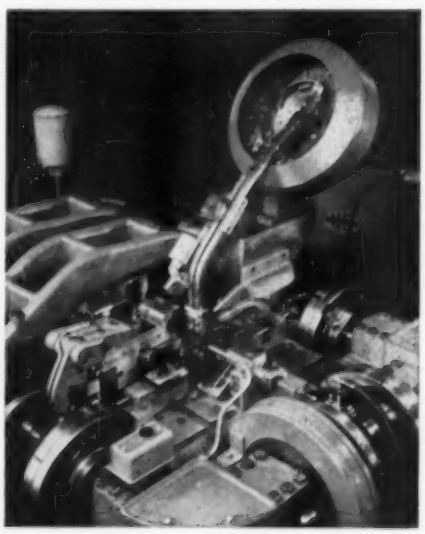
One of the aims of Automation should be the elimination, wherever possible, of secondary operations and handlings. You, like all manufacturers, are interested in attaining this result. The U. S. Multi-Slide can be the answer in the production of stampings.

The sequence-of-operations strip pictured above shows how a complete assembly is produced on the U. S. Multi-Slide without secondary operations. The finished assembly is an automotive fastener comprised of a sheet metal stamping and a nut. The stamping is produced on the U. S. Multi-Slide and the prefabricated nut is hopper-fed into proper position for automatic assembly. The complete unit is produced at the rate of 100 per minute – without handling.

The elimination of secondary operations results in reduced cost per piece, an all-important factor in today's competitive market. If you produce stampings and are interested in low piece part costs, why not investigate the use of U. S. Multi-Slide Machines?

Ask for Bulletin 15-A giving complete specifications.

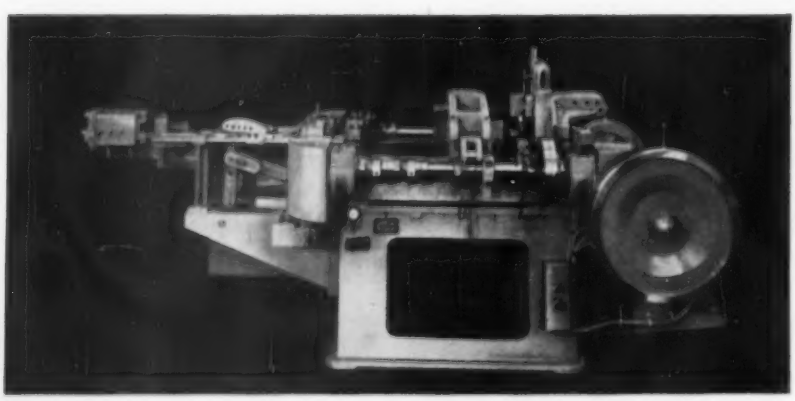
Below: Hopper feed unit mounted on U. S. Multi-Slide Machine for hoppering the nuts into position for assembly.



U.S. TOOL COMPANY, Inc.

AMPERE (East Orange)
NEW JERSEY

Builders of U. S. Multi-Slides
U. S. Multi-Millers
U. S. Automatic Press Room Equipment
U. S. Die Sets and Accessories



Left: Standard No. 33 U. S. Multi-Slide Machine on which the hopper feed unit is installed.

"Same Day" Shipment

from Ex-Cell-O's huge stock of precision

Drill Jig Bushings

Whatever your requirements, Ex-Cell-O's complete bushing service will give you full satisfaction with every order! For your convenience, Ex-Cell-O maintains huge stocks of precision Drill Jig Bushings, and efficient expediting facilities which make possible "same day" shipment. This means orders are filled and dispatched from complete inventories in New York, Detroit, Los Angeles and London, Ontario, within a few hours after they are received!

Made of wear-resistant bearing steel, Ex-Cell-O Drill Jig Bushings are precision machined to meet Ex-Cell-O's rigid quality standards. Ex-Cell-O's exclusive hardening process produces bushings guaranteed uniform within 62-64 Rockwell "C". All Ex-Cell-O bushings are heat treated in Ex-Cell-O's atmosphere-controlled equipment. You can count on the tested and proved superiority of these high chrome, high carbon, oil hardening bearing steel bushings.

Call, wire or write Ex-Cell-O for the world's finest, fastest and most complete bushing service!

For your engineering and purchasing files: The complete Bushing Guide. Pictures and describes A.S.A. standard bushings, lists hundreds of Ex-Cell-O bushings available from stock. Write for as many copies as you need.

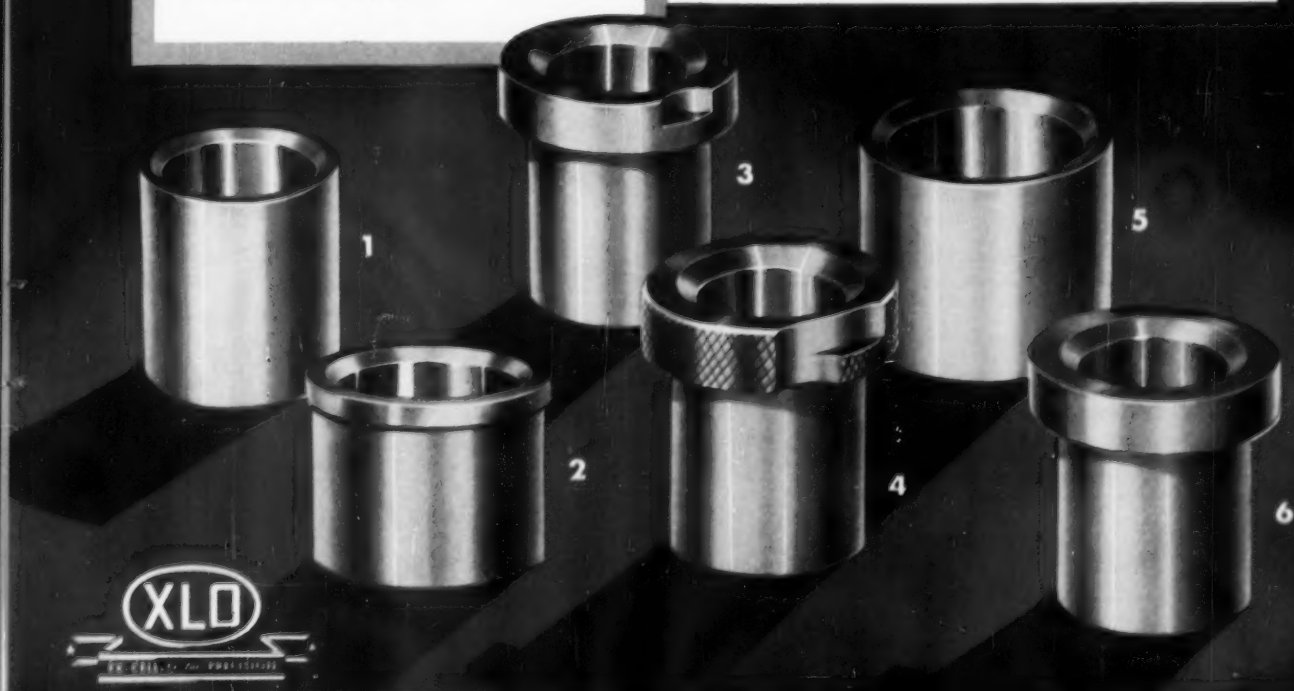
1. Headless Press Fit Bushings are used when center distances are too close for bushings with heads. 2. Head Liners are used (in place of headless liners) when excessive pounding is involved. 3. Fixed Renewable Bushings are used with liners when replacement bushings are required during the life of the jig. 4. Slip Renewable Bushings are used with liners when two or more operations require change. 5. Headless Liners are pressed permanently into the jig plate for accurate replacement of renewable drill bushings. 6. Head Press Fit Bushings are used when bushing replacement is not required during the life of the jig.

EX-CELL-O
CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

56-12



XLO

Finish
SQUARE
HOLES
Faster... At Far
Less Cost... with

Minute Man
SQUARE
BROACHES

Starting with a round pilot, you can finish an *accurate* square hole in a drilled, reamed or cast bore in one *pass* in *less than one minute* with a Minute Man Square Broach.

Used in a hand-operated or hydraulic press, these High Speed Steel Push Type broaches are ideal for putting square holes in boring bars, for jig, fixture and die work and for square coupling work.

They are available from stock in eight standard sizes from 3/16" square to 3/4" square.

More Time-And-Money-Saving
Minute Man BROACHES

Hexagon Broaches, for holes from 1/16" Hex to 3/4" Hex, offer the same production advantages as square broaches.

Production Type Keyway Broaches speed the quantity production of keyways in a specific diameter of bore. For 1/4", 3/16" and 1/8" keyway widths.

Keyway Broach Kits for cutting keyways from 1/16" to 1" in any bore from 1/4" to 3" in *one minute* for as little as *one cent* each.

The duMONT CORPORATION
Greenfield, Mass.

MAIL FREE BROACH CATALOG AND PRICE LIST A describing Square Broaches, Hexagon Broaches, Production Type Keyway Broaches and Keyway Broach Kits to

Name .....

Company .....

Address .....

Backlash

SEND LETTERS TO:
BACKLASH EDITOR American Machinist
330 W 42nd ST, N Y 36, N Y

Oops!

In Shop Shots (AM—Mar 12 '56, p202) two issues ago we showed how TV does a real inspection job in cooperation with a microscope—to inspect chrome-plated scraper blades. We failed to credit the idea correctly; instead of naming American Can Co, we mentioned some other company. Actually, the idea was Frank Connelly's at American Can's Cincinnati plant. The blades are used in Canco's lithography-coating machines. Two thin lines appear on the TV screen—these are the allowable limits. The blade edge appears between them, and it's easy to see if the blade is within specs or not.—Ed

Hitting Home

I have just completed reading your special report "Industrial Disaster Control," (*AM*—Feb 27 '56, p129), and wish to extend my appreciation for a job well done in preparing it. I have personally been at the head of our local Civil Defense organization for the past several years and have found that industry in this locality has offered little or no assistance in formulating an organization, as their feeling is more or less on the negative side. Maybe through such reports as this, more can be accomplished. Without their financial support, and that of the city and county, little can be done, as the mass of the population does not have the time.

James H Butler
Texas Foundries Inc
Lufkin, Texas

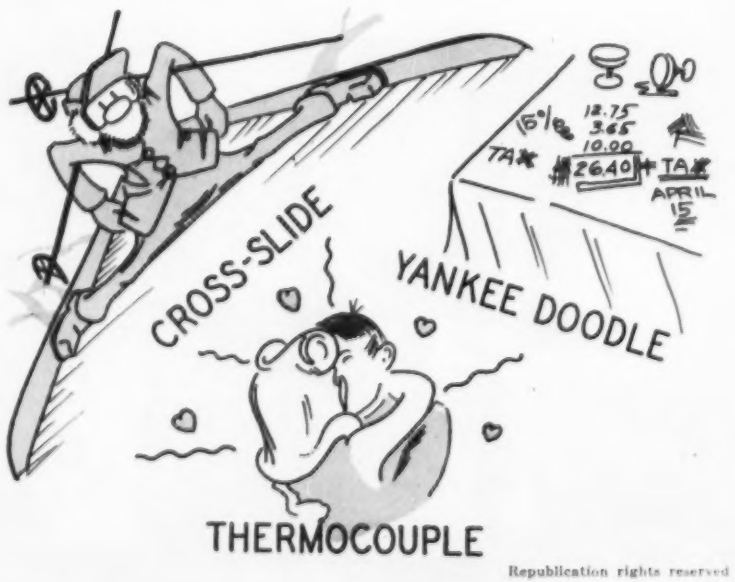
Skill for Sale

I read your editorial, "More Skilled Men" (*AM*—Dec 19 '55, p103) and, as an old machinist and tool designer, I must agree with you. As you say, something must be done, but nobody seems to be actually doing very much.

A good training program would

GRINETICS

By D G SMITH



Republication rights reserved

At Ford Instrument Co., the answer is *Leland-Gifford* Drilling Machines

Problems involving precision mechanisms are duck soup for Ford Instrument Company, Division of Sperry Rand Corporation. They have the talent and the equipment to produce the right answers in the simplest and most practicable form.

Among their equipment is this battery of Leland-Gifford multiple spindle drilling machines. Here precision drilling operations are handled with efficiency and dispatch.

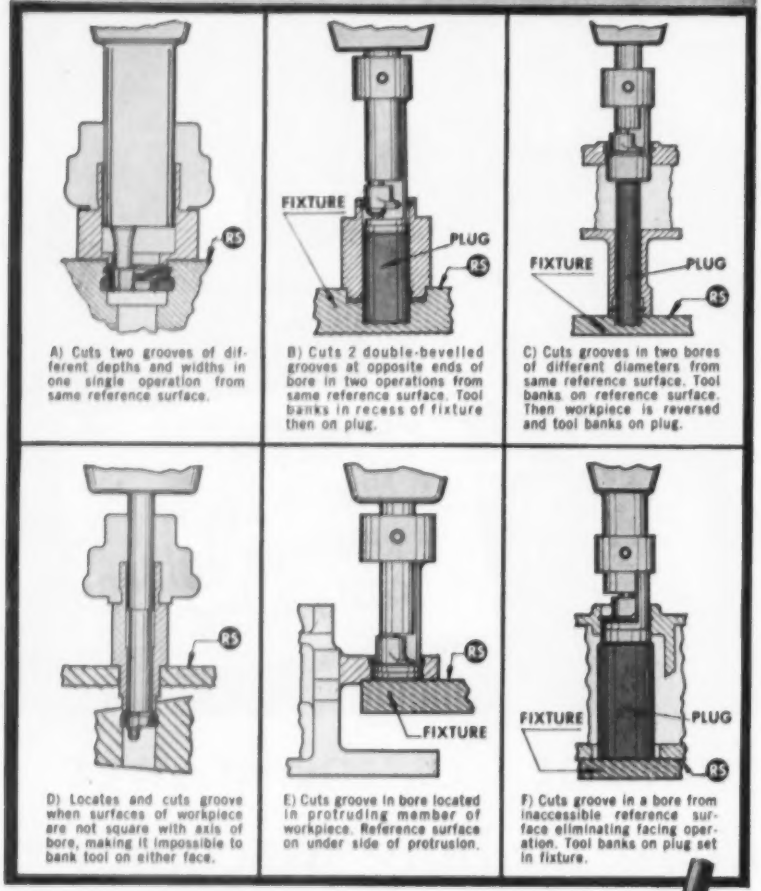
The right tools are ready for use in the right sequence and combination for drilling, reaming, tapping, countersinking, counterboring or spot facing. Work moves smoothly from one spindle to the next, requires a minimum of handling even for the most complex pattern of holes.

Leland-Gifford multiple spindle drilling machines are available in a complete family of sizes and in a wide range of swings, number of spindles and types of feed. New bulletins give complete information. Write for them.

LELAND-GIFFORD
Drilling Machines
WORCESTER 1, MASSACHUSETTS, U.S.A.

CHICAGO 45
2515 West Peterson Ave.
DETROIT
10429 West McNichols Rd.
CLEVELAND 22
P.O. Box 853
NEW YORK OFFICE
75 South Orange Ave.
South Orange, N. J.
LOS ANGELES OFFICE
2620 Leonis Blvd.
Vernon 58, Cal.
INDIANAPOLIS 6, P. O. Box 1051
ROCHESTER 12, P. O. Box 24, Charlotte Station

Even Unskilled Labor Can Use This Versatile Tool Accurately! It Simplifies Internal Grooving Problems, Cuts Production Costs!



A) Cuts two grooves of different depths and widths in one single operation from same reference surface.

B) Cuts 2 double-bevelled grooves at opposite ends of bore in two operations from same reference surface. Tool banks in recess of fixture then on plug.

C) Cuts grooves in two bores of different diameters from same reference surface. Tool banks on reference surface. Then workpiece is reversed and tool banks on plug.

D) Locates and cuts groove when surfaces of workpiece are not square with axis of bore, making it impossible to bank tool on either face.

E) Cuts groove in bore located in protruding member of workpiece. Reference surface on under side of protrusion.

F) Cuts groove in a bore from inaccessible reference surface eliminating facing operation. Tool banks on plug set in fixture.

Amazingly versatile! Your toughest recess cutting problems can be met simply and efficiently with the Waldes Truarc Grooving Tool because it offers a whole range of possibilities beyond the range of ordinary recessing tools.

Wide Cutting Range! The Waldes Truarc Grooving Tool comes in 5 models...enabling you to cut accurate grooves in housings with diameters from .250 to 5.00 inches.

Send Your Problems to Waldes! Send us your blueprints...let Waldes Truarc Engineers give you a complete analysis, price quotation and delivery information on the most economical tool set-up for your particular job. There is no obligation!

Write NOW for a 20-page manual containing full information on Waldes Truarc Grooving Tool

WALDES TRUARC® GROOVING TOOL

Made by the Manufacturers of Waldes Truarc Retaining Rings
WALDES KOHINOOR, INC., 47-16 Austel Place, L. I. C. 1, N. Y.
Waldes Truarc Grooving Tool Manufactured Under U. S. Pat. 2,411,426

AM048

Waldes Kohinoor, Inc., 47-16 Austel Pl., L.I.C. 1, N. Y.
Please send me your new 20-page technical manual on the Waldes Truarc Grooving Tool. (GT-2-53)

Name_____
Title_____
Company_____
Address_____
City_____ Zone_____ State_____

help a great deal if only someone would get it started. I have neither the money nor the facilities to start one myself, but one thing I can do is teach.

After 35 years in shops, in jobs ranging from leading man to group leader in charge of job planning and tool designing, I know the value of good training. I have done a lot of it. On-the-job training of trainees, both before and during the war, and, for the past ten years, as an official teacher of mathematics and engineering drawing with the Dept of Public Instruction in Honolulu. I have also taught physics and public speaking, the latter being extremely valuable to potential supervisors. I taught for five years at the Honolulu Technical School and am now at the Pearl Harbor Navy Yard Apprentice School.

This month, I shall be 65 years old, and shall be retired next August, just when I am getting to the point where my training and experience should count the most. I know just what types of mathematics and drawing should be taught to the various trades for the best results, and can teach these subjects, shop work or tool design, or can even supervise such a school.

You are evidently interested in such a school—at least you wrote the editorial—and should there be one started with an opening for someone with my background and experience, I would be more than happy to fill the position, if given the opportunity.

Do you know of anyone who is doing anything along these lines, or who could be persuaded to start something? Once started, it would be quite easy to keep it going. Should such an opportunity occur, I will be available any time after July 20, 1956.

I had a physical examination about six months ago, and the doctor gave me a clean bill of health, telling me that I should be good for at least ten more years of activity, and I hate to waste this time when there is so much to be done.

Ernest T Owen
Honolulu, Oahu, TH

Here's another example of the shocking waste of manpower and experience brought about by our outmoded compulsory retirement rules. A ripe orange, left on the tree, will stay fresh and juicy for many months. It is only when it is plucked that it begins to deteriorate.

Perhaps one of our readers may suggest some opening where a lifetime of experience can be put to useful purpose.—Ed.

Hell on Wheels

I have read Mr. Colvin's letter (*AM*—Mar 12 '56, p130) with considerable interest and am much inclined to agree with him. Your excellent articles on automation have shown how exactly component parts can be inspected during production, but there does not seem to be any interest in inspecting a complete assembly.

Less than a month ago, I bought a new car of a famous make, and here's what I found: One door rattled badly, the gas gage would not work, the stop lights did not go off when the brakes were released, the automatic transmission was only half-full of oil, the heater fan did not operate, the lights were improperly adjusted, the seat cushions were streaked with dirt, the trunk lid would not close properly, one windshield wiper did not work properly, and the windshield washers squirted water over the top of the roof instead of on the windshield.

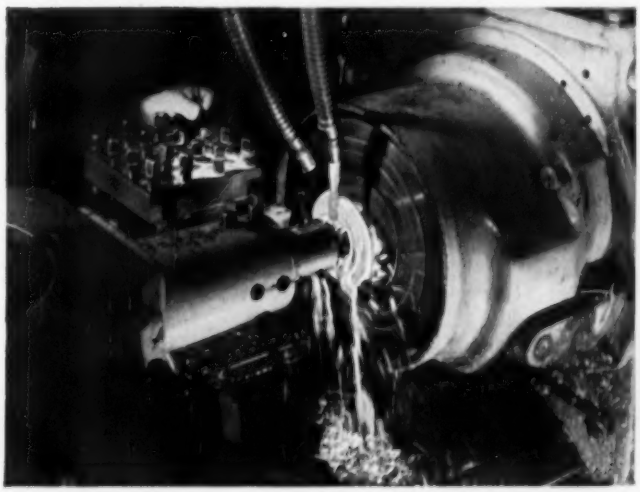
Now, admittedly, these are all minor matters that the dealer had to attend to at his expense. But they were very annoying and should not have happened. The dealer was supposed to check everything before the car left his shop, but he admitted that his mechanics had "slipped up" on this one. But the point is that I paid the factory a large sum of money and have a right to expect a perfect product. In the price I paid there was certainly included a substantial amount for inspection. Obviously, this inspection was never performed by the factory, and I do not see why the dealer should be expected to correct the factory's mistakes, or why I should take time and trouble to take the car back to him time after time.

Let's have a little less advertising bragging about the Heavenly qualities of the new cars, and give them a Hell of a good inspection before they leave the plant. That's the best way to keep customers happy.

H A Ritter
Buffalo, NY

Improved Lusol..

A BETTER PRODUCTION METHOD



Improved Lusol, an oil-free transparent water-soluble metalworking solution, has the highest heat removing capacity of all coolants, regardless of type. It keeps tools cooler so cutting edges last longer. It keeps work pieces cooler so closer tolerances can be maintained. In addition, the Lusol method keeps machines clean, eliminates odors, smoke and oily floors, and eliminates the basic causes of dermatitis. It all adds up to better production under better working conditions. That is worth investigating.

CONCENTRATION TEST KIT

With this pocket size Concentration Test Kit Lusol users can check the concentration of the solution right at the machine. Only takes a minute or two.

THE Lusol.. LINE
BETTER PRODUCTS FOR BETTER METALWORKING

F. E. ANDERSON OIL COMPANY INC.
PORTLAND CONNECTICUT

NEW CINCINNATI 16″ SLIDING HEAD DRILL THAT LOOKS AS GOOD AS IT RUNS

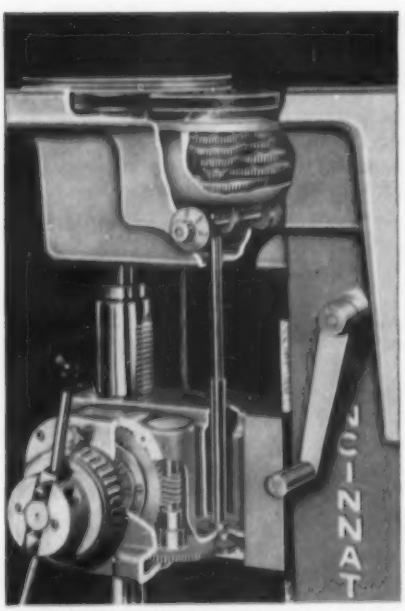
Here is in-the-metal-proof that a drill doesn't have to be homely to be good. The new Cincinnati 16″ sliding head drill can turn your shop into a showroom in appearance and performance.

Operators like this new drill because every important element is conveniently located and built in . . . power take-off, gearbox, feed selector, positive jaw clutch, electrical controls, depth dial, counterbalance spring, contour-fitting belt guard.

Best of all, this new drill can be equipped with power feed at slight additional cost . . . bringing the production advantages of automatic operation within the budget of any shop. Every drill is built to real machine tool standards of accuracy, and tested before shipment. A record of these tests is kept for permanent reference at CL&T. Bench, floor, and multi-spindle models available *now*.

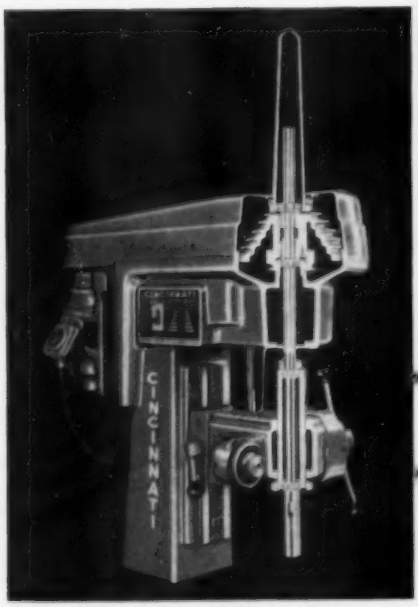
Write for catalog D-138 and name of your local dealer. Cincinnati Lathe and Tool Company, 3244 Disney, Cincinnati 9, Ohio.

CINCINNATI LATHES and DRILLS

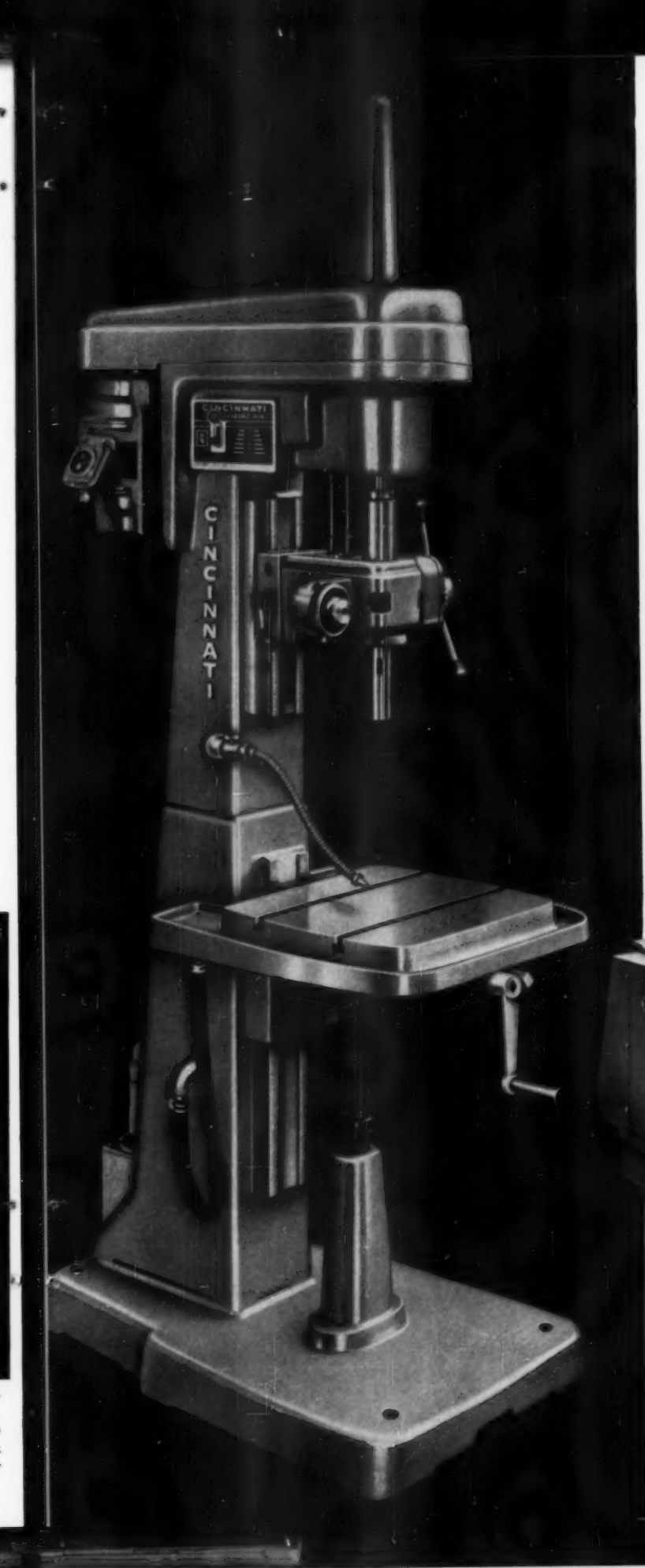


NEW GEARED POWER FEED—Positive jaw clutch engages four power feeds—.002″, .005″, .009″ and .015″ per spindle revolution. Automatic disengage for identical operations. Unit construction.

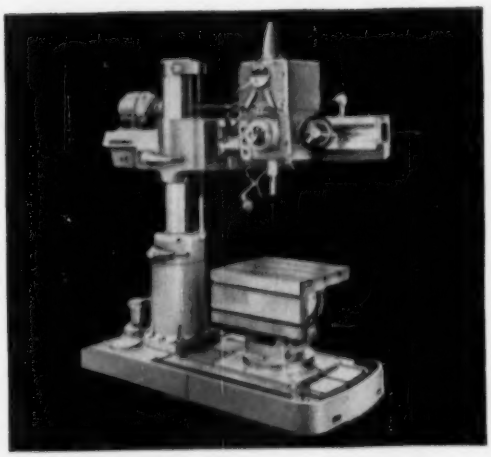
NEW ELECTRICAL CONTROLS—Built right into the head. All drills are shipped *complete* with motors and controls—no installation delays, just connect your power leads, and switch on the motor.



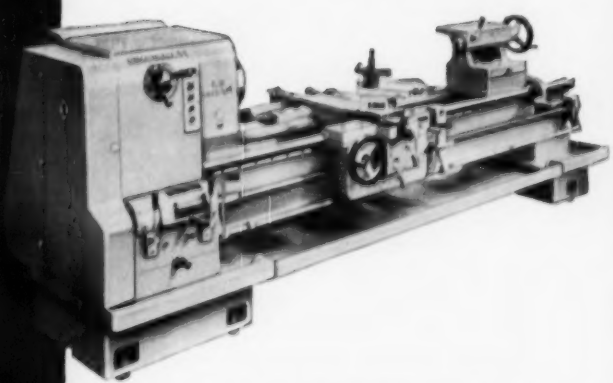
NEW FULL-FLOATING SPINDLE—All this spindle takes is torque! Four precision, sealed, lifetime lubricated bearings (two on spindle and two on pulley) take radial and thrust loads. Six spindle speeds. No. 2 Morse taper is standard; No. 3 Morse taper optional.



SEE THESE OTHER BRAND-NEW CINCINNATI TOOLS



3' 7½" Radial Drills with Hard Clad Columns.



10", 12½", 15", 18", 21½" and 26" Tray-Top Engine, Toolroom and Fixed Gap Bed Lathes with Hard Clad Bedways.

center on . . .

cincinnati lathes and drills

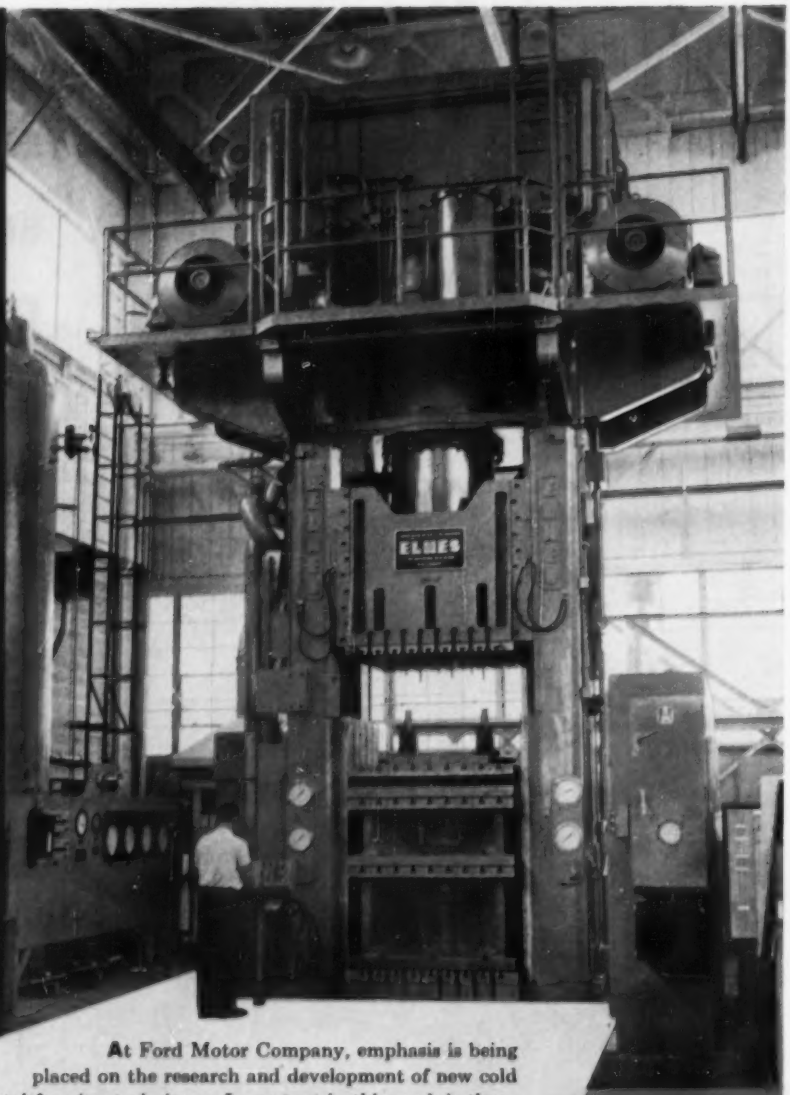
Unique

ELMES *Press*

at Ford Motor Company

helps solve research problems in cold metal forming . . .

at minimum cost!



Elmes 1500-Ton Development Press at Ford Motor Company. This press can perform work at full tonnage at rate of 600 ipm., using only 250 hp. Die space, 60" x 60". Opening, 132". Stroke, 42".

At Ford Motor Company, emphasis is being placed on the research and development of new cold metal forming techniques. Important in this work is the custom-built Elmes Press shown above . . . a 1500-ton hydraulic press designed specifically for this program.

Having all the inherent advantages of hydraulic press operation, this press can also simulate the stroke action of a mechanical press. This unique operational versatility enables Ford to determine in advance the proper size and type of production press—hydraulic or mechanical—which will be most efficient for a particular job. As a result, Ford is able to go immediately into production without a lengthy and costly tryout period on regular production line presses.

Like other leading manufacturers, you too will profit when you *bring your pressing problems to Elmes.* New Bulletin No. 1010-C gives complete data on Elmes Metalworking Presses. Recommendations and cost estimates are yours for the asking. Contact the Elmes distributor in your area or write to us direct.

ELMES

AMERICAN STEEL FOUNDRIES • ELMES ENGINEERING DIVISION
1161 Tennessee Avenue . . . Cincinnati 29, Ohio

HYDRAULIC PRESSES & EQUIPMENT

METAL-WORKING PRESSES • PLASTICS MOLDING PRESSES • PUMPS • ACCUMULATORS

Spot News of Metalworking...

- **World's biggest plating machines — two of them 750 in. long** — will handle bumper plating for Ford. They've been ordered from Udylite Corp, Detroit.

- **Molybdenum has been extruded recently at 300 F** by Climax Molybdenum Co. At this temperature, properties are better and more uniform than when extrusion is made at 2200 F. Glass-fiber lubricant, a fast cycle, and tungsten HSS dies make it possible.

- **Buick will have a third turbine in its 1957 models' automatic transmissions,** according to current rumors around Detroit.

Widespread raiding of skilled tool and die makers by firms in other cities has Chicago shops worried. To offset it, Chicago shops are (1) filing job orders immediately with Chicago employment centers, (2) keeping skilled workers happy by working 45 to 50 or more hours a week. Out-of-towners tried a raid on another city's employment centers recently, were stymied by extremely uncooperative state employment officials.

- **Ten-year instalment-buying plan for NATCO tools,** geared to new depreciation schedules, is being offered by National Automatic Tool Co, Richmond, Ind. Automatic single- and multiple-spindle machines for drilling, boring, and tapping will be offered on either three or 10 year terms.

- **Mass-produced standard inclinable press parts for 4- to 60-ton presses** are being mass produced for the first time in the West by E W Bliss Co's new San Jose, Calif, plant for immediate delivery on the West Coast.

- **Another one for your now-you-can-buy-it-on-time file:** Charles Bruning Co's Copyflex reproduction machines, drafting furniture and machines, surveying and optical tooling instruments. Terms: either three or seven years.

- **Monthly reports on non-classified research and development in Metalworking,** metallurgy and allied fields can be had for $1.25 each from Office of Technical services, Commerce Dept, Washington, D C. Ask for *Report of NRL Progress.* January and February issues are now available, contain articles on hot cracking of stainless weldments, warm-stretching of aircraft skins, many others.

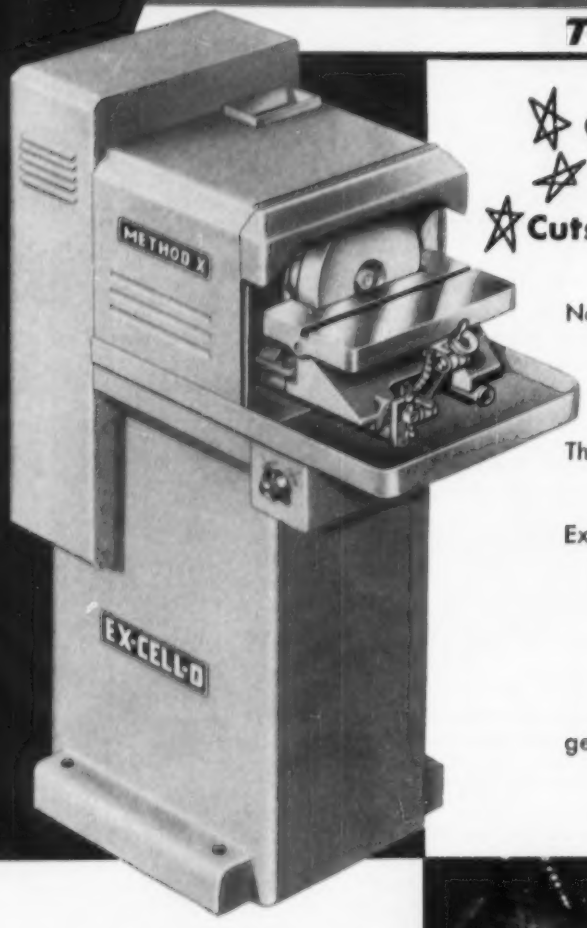
Will small metalworking firms eventually have to buy parts abroad to compete with bigger firms? It's already happening, according to industrial consultant C H Welling, who says one business machine firm gets its calculating machine parts from its plant in Scotland, and imports German cash registers for U S consumption. Reason for the trend, he says, is that the little firm can't match the big firms automation, high output, and mass distribution.

- **Government's "our business is to help business" policy** was demonstrated recently in Boston, when the Commerce Dept and Small Business Administration talked turkey with New England businessmen and state officials. Object: to tell firms how best to make use of government assistance.

- **Bids are again open on the government-owned foundry at New Castle, Pa.** Its sale to United Engineering & Foundry Co has been canceled by General Services Administration, because one of United's competitors, Pittsburgh Steel Foundry Co, claimed the sale would give United an unfair competitive advantage.

Save the Cost of Diamonds with

EX-CELL-O Method X TOOL SHARPENER



Style 43 Ex-Cell-O Method X Tool Sharpener.

- **Cuts any conductive material**
- **Does both roughing and finishing**
- **Cuts carbides and steel at the same time!**

Now you can sharpen the hardest single-point tools without using diamonds or abrasive wheels. Using the electro-spark principal in off-hand sharpening, Ex-Cell-O Method X produces a non-directional matte finish with none of the abrasions caused by conventional grinding. The coarseness of texture and cutting speeds are controlled by an electric control switch. The "grinding wheel" is actually a 10" cast-iron disc which is rotated by an Ex-Cell-O precision spindle with inbuilt motor. A spark gap is maintained between the disc and work piece across which current pulsations jump to do the cutting. No coolant is required in the sharpening process.

After brief instruction, men with conventional grinding experience can readily adapt their skill to Method X. Get all the facts about this new cost-saving process--get in touch with your local Ex-Cell-O representative today.

Popular at the Show. **At the Machine Tool Show, hundreds of men were impressed by this diamondless tool sharpener that lengthens the life of carbide tools because it leaves NO heat checks, NO grinding cracks, and NO saw-tooth Cutting edges.**

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Washington . . .

Ruckus over Red turbodrills . . .

The issue of Soviet-US trade has been sharpened by discussion over the Soviet turbo drill for drilling oil wells.

Dresser Industries Inc obtained 10-year rights to market the drill in the US—providing, say the Russians, they get something in return. They'd like to import high-speed drill bits and technical information on the latest US processes for hardening them.

It's just this sort of item that administration officials consider of strategic importance, and hence not exportable to buyers behind the Iron Curtain.

Dresser officials, on the other hand, say that the information involved is not of critical strategic importance to the Russians—and that the US would get more out of the exchange than we would be giving away.

The issue is sharpened by criticism being directed against the administration already by Congressional committees (controlled by Democrats) who say too many critical items now are finding their way to the communists.

Czar with limited powers?

Eger V Murphree, president of Esso Research and Engineering Co, has been named Special Assistant to Defense Secretary Wilson to "direct and coordinate" the ballistic missile programs. The press has tagged Murphree as a new guided missile "Czar." But it's doubtful he'll have authority to direct missile development on his own. When Murphree gets in a squeeze, he'll still have only the same appeal to Wilson as the Service secretaries.

Murphree's appointment comes at a time when the administration's handling of missile development is under critical fire from Democratic Congressmen. A Senate probe into the administration's airpower policies, headed by Senator Stuart Symington (D, Mo), is getting under way now.

Rep George Mahon (D, Tex), chairman of the House Military Appropriations Subcommittee, however, has taken some of the sting out of the Democratic charges that the US lags behind Russia in developing ballistic missiles. Says Mahon, whose position is an influential one: "No one can prove with complete accuracy who's ahead on ballistic missiles. Neither Russia nor the US has an effective intermediate-range or intercontinental missile, so it's hard to evaluate."

Lukewarm AF budget hike . . .

The administration will go along with Congressional pressure to boost the Air Force budget—but not too ardently. The Pentagon is readying a supplemental Air Force appropriation request of up to $200 million for fiscal 1957. It falls far short of the $1.5 billion hike Senator Richard Russell (D, Ga), Senate Armed Services Committee chairman, has called for. Right now, Pentagon budget officials are deciding how the additional money would be split between procurement, research and development, and other programs.

The Pentagon shaved $2.3 billion off the Air Force's initial budget request.

Foreign aid outlook . . .

As an answer to Russia's economic offensive, Washington will maintain foreign aid spending at present levels—assuming Congress says yes. The administration seeks $4.9 billion in new funds for economic and military aid. Economic assistance would account for $1.9 billion of this—75% to go to Asia and the Middle East. Military aid takes up $3 billion of the request—a hike of $2 billion over last year's—the added money to build up a backlog of weapons. One controversial point in the new program: the President wants authority to commit economic funds in advance of appropriations as a help in financing long-term development projects in underdeveloped countries.

The level of military hardware procurement under the Foreign Aid Program is likely to rise slightly over the next two to three years, mainly because of the shift from conventional weapons to guided missiles and nuclear weapons in NATO's forces. There's a special $530-million fund earmarked for "defensive advanced weapons systems."

Dark clouds over labor . . .

The wage bargaining picture, already clouded by bitter strikes, shows some ominous signs for the future.

Settlements between the aircraft industry and the AFL-CIO Machinists' Union are setting the early 1956 pattern at close to 10¢ an hour, but not without trouble.

Aircraft companies are showing resistance to pattern settlements. There's a drive afoot to equalize contract costs, which some firms claim have gotten out of line.

And it looks like bigger problems ahead. Preliminary negotiations with a June 30 contract deadline are coming in the basic steel industry. The powerful Steelworkers' Union has a costly set of demands, topped by a proposal for overtime pay for work on weekends. This seems sure to be resisted by the industry which runs an around-the-clock operation, and where overtime pay traditionally comes only after five days' work. What happens in steel may spread to steel fabricating, non-ferrous mining and other related industries.

MICROHONING*

Generates . . .

ACCURATE, ROUND, STRAIGHT SURFACES

Truly round, straight surfaces are generated by the application of fundamental principles on which the Microhoning process and equipment design are based:

The combined reciprocating and rotating motion of the tool act on the full length of the bore on every stroke.

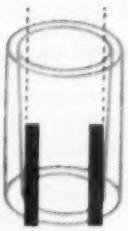
The self-dressing abrasive assures sharp grits and cutting at all times.

The tool and bore automatically align themselves.

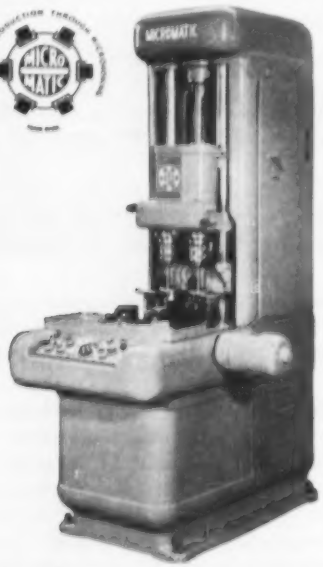
The feed-out of the tool is positive with equal pressure in all directions from the center line.

All out-of-roundness is removed by the expanding abrasive "cylinder" formed by the rotating tool. Only the tight areas are abraded until all areas have the same radius from the axis.

Wavy or snaky surfaces are made straight by the long abrasive sticks shearing off the crests of the waves.



In tapered bores the abrasives cut only in the tight area until the cylinder has the same diameter throughout its full length.



ACTUATING LEVER

Steel Forging • 58 to 60 Rockwell "C"

Bore out-of-round and tapered .0015 to .0025 inch.

Microhoning reduces error to less than .00015 inch

Removing approx. .005 inch stock

Production—130 pieces per hour

Machine—Model 705-2 Hydrohoner

***MICROHONING = Stock Removal + Geometry + Size Control + Surface Finish**

MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

Detroit . . .

Turbines away!

Plymouth's gas-turbine car at this writing is en route from New York to Los Angeles in a bold move to make the public gas-turbine conscious. No matter how the test run turns out, its significance can't be overlooked.

If the turbine fails to hold up under 3020 miles of road driving, its introduction on models could be held up for quite a spell.

But if the turbine comes through with high marks, it's no secret that the auto industry will redouble its efforts to whip the metallurgical and tooling problems involved in turbine blades. And there'll be an all-out race to put the first turbine-powered car into the salesroom.

Plymouth's gas turbine is no overnight wonder. Since last July, a Plymouth has been driving all over Detroit, powered with this same turbine. A number of refinements have been added since as it underwent traffic and track tests.

This isn't the first long-distance tryout for Chrysler's gas turbine car, either. In February it ran a nonstop jaunt of 3200 miles at the Chrysler test track. That run ended with a failure in the reduction-gear box. The turbine was OK.

The improbable is being done . . .

At second glance, many of the gas turbine's supposedly insurmountable difficulties aren't at all hard to overcome. Many thought turbine balance was the toughest problem. That's been easily overcome, and heat and noise have been sharply reduced.

Proof of this is that the turbine-powered Plymouth has been operating in Detroit traffic for months, with very few motorists aware that it was in the same cluster of cars at the traffic light.

If it passes your neighborhood, you can recognize Plymouth's turbine car this way: the exhaust pipe is extra-wide and in the center of the rear bumper, and the car whistles very softly as it accelerates. If you're behind it, you won't feel a searing blast of exhaust heat. That's been eliminated. So has high fuel consumption, to a point where it doesn't cost much more to operate than a conventional auto engine.

They're all scouting Plymouth . . .

Other automakers have eagle eyes on the result of Plymouth's test run — because the big boys have their own counterparts—like GM's Firebird II, and Ford is rumored to have at least one turbine-powered model under road test . . . and a turbine-powered truck.

When will turbines hit the trade? Best guess to date, and it was made last April before a more efficient regenerator brought fuel economy up, is from an exhaustive survey of top automotive and oil engineers made by McGraw-Hill's *National Petroleum News*. The consensus: anywhere from 1960 through 1965.

Output follows '55 pattern . . .

April-through-June auto production will be about 2% above January-through-March output. This is almost identical with 1955's pattern.

Inventories are still at a high level, but some observers point out that with 1955's record sales and an "excellent sales pattern expected for '56," a new look must be taken at what will be called a "high" inventory, and what will be called a "slightly high" inventory. For example, in 1955 the auto industry turned out its 2-millionth vehicle on March 29. In 1956, No. 2,000,000 came out just nine days later calendarwise.

Production figures for the week ending March 24 show that GM produced 54.87% of the market (up 5% over comparable 1955): Ford went down less than 1% from 1955 to 25.28% of the market: Chrysler dropped 5% to 14.99%, AMC went up 1% to 2.44%, and Studebaker-Packard dropped less than half a percent to 2.42%.

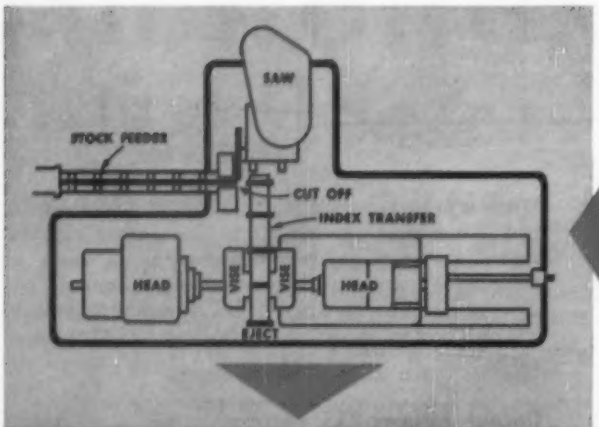
Detroit odds and ends . . .

Dates have been set for the first National Auto Show since 1940 — it'll open December 8 at New York's new Coliseum, will run through December 16.

American Motors is cutting back output 34%. Output has fallen off in all lines except the Rambler.

This isn't too alarming. Traditionally, the automakers work hard after the introduction of a new model to build dealer stocks. Then they slack off until the spring buying surge. AMC is actually the last of the auto companies to go into its slack period this year—a solid indication that sales following introduction of new models are running well ahead of schedule.

GM will build a tremendous Buick-Olds-Pontiac plant in the San Francisco-Oakland Bay area soon. Expected to be in full production by 1958 model introduction, the plant will employ 5000 and will turn out 100,000 cars a year. It'll be considerably bigger than the B-O-P plant at South Gate, Calif. Output of both is slated for the California, Oregon and Washington markets.

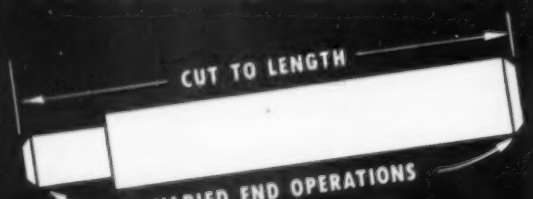


HOT BED OF ACTIVITY

Motch & Merryweather's new transfer machine widens the horizon for the simultaneous double-end machining of bar stock or tubing. Combined with cut-off to accurate length are: centering, chamfering, turning, drilling, or boring. Box mill turning is performed along with center drilling and chamfering. From stock pile to discharge, all operations can be fully automated. For the quickest answer to speed your stock processing, send us your part drawing.

Simultaneous

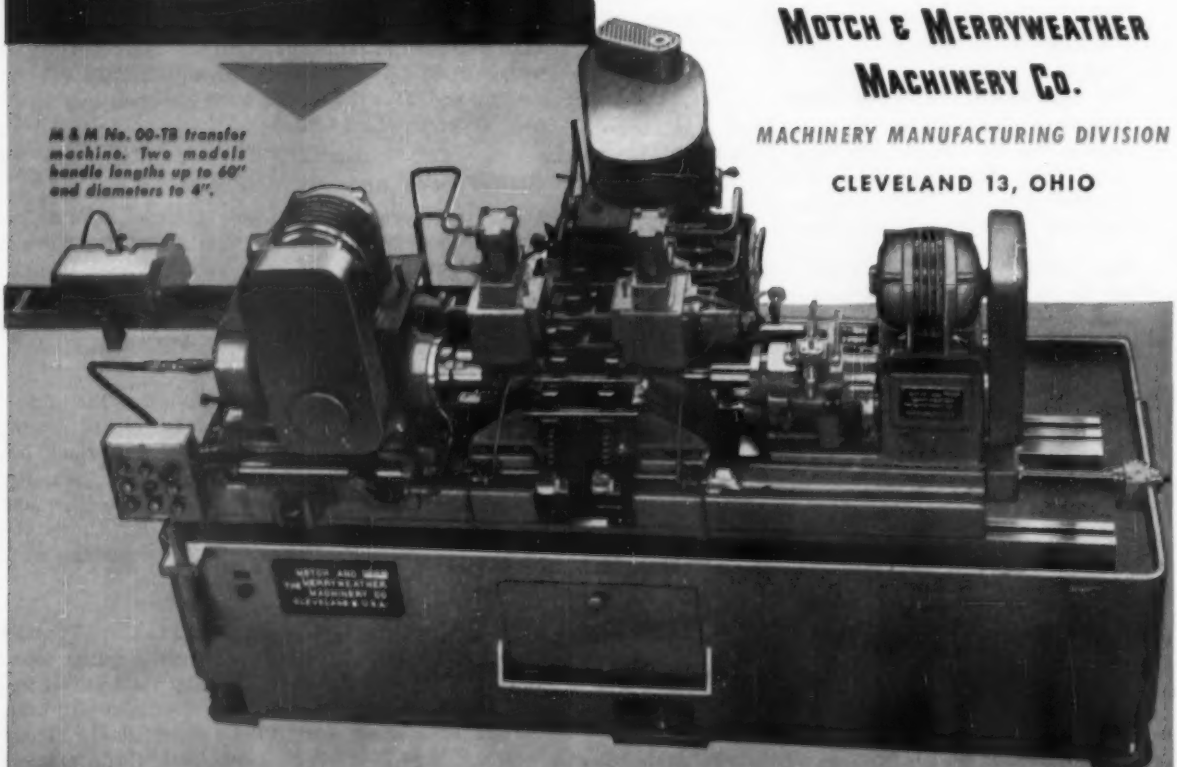
STOCK CUT OFF and DOUBLE END MACHINING



THE MOTCH & MERRYWEATHER MACHINERY CO.

MACHINERY MANUFACTURING DIVISION

CLEVELAND 13, OHIO



M & M No. 00-TB transfer machine. Two models handle lengths up to 60" and diameters to 4".

BUILDERS OF AUTOMATIC PRECISION CUT-OFF, MILLING, AND SPECIAL MACHINERY

Machine Tools . . .

Battling the backlogs . . .

Machine tool backlogs have increased rapidly in recent months, as shipments of the machine tool industry lagged compared with new orders.

Builders attending the spring meeting of the NMTBA have a logical explanation for the failure of production to go up sharply in response to demand.

It has little to do with the adequacy of plant facilities. It stems from a variety of other reasons.

First of all, the expansion of work forces today is a slow process. It is hard to get men even for a main shift. All of the desirable workers already have jobs.

Night shifts are viewed as poison by prospective employees, who can go outside the machine tool industry and get day-shift jobs.

Then there is the problem of sufficient engineering staffs. It is even harder to get draftsmen and engineers than it is factory workers.

When orders come in, most of them have engineering work to be done on them before they arrive at the production stage. Machine tools today are, in large part, tailor-built.

More than that, machine tools in general are much more intricate than they used to be and the lead-time in building them is proportionately longer.

Add onto all of these factors another handicap. Most builders have been trying to get new models into production. Only prototypes of the new designs were on display at the Machine Tool Show last September, in many cases.

It is not hard to conclude, on the basis of this evidence, that rapid acceleration of machine tool production would have been miraculous. It was strictly outside the realm of reason.

This is not to say that machine tool shipments later on this year are not going to be in much bigger volume than they are today. They obviously will be.

But expansion of production and the whittling down of backlogs take time. The current productive facilities of the industry have little to do with the current level of shipments.

Dollar shipments are no gage . . .

The fact is that dollar shipments today do not provide a current method of gaging the current position of the machine tool industry.

This was brought out at the NMTBA meeting by Joseph P Crosby, Director Metalworking Equipment Division BDSA.

One cannot compare dollar shipments now with those in 1952 or 1942, he pointed out.

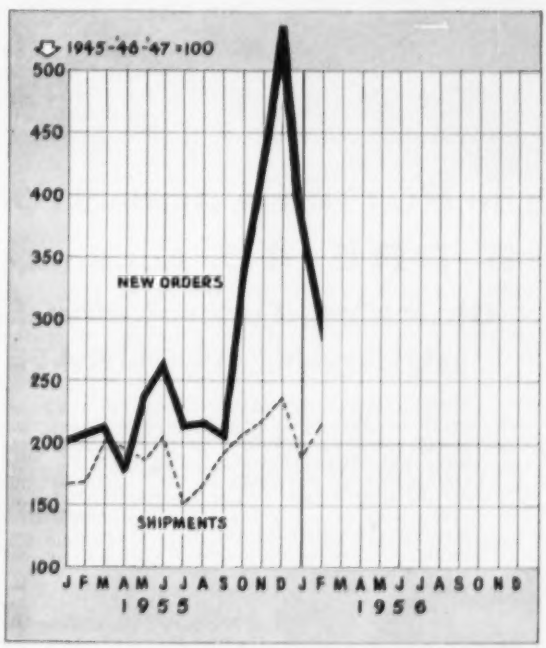
Increased prices must be taken into consideration. Beyond that, the average machine is much more intricate than it used to be and contains a lot of parts and subassemblies, such as electrical components, that are supplied from outside and do not represent hours of work in builders' plants.

Turbines and gears OK'd . . .

The turbine and gear program, which has been on an off for more than a year, has at last been approved by ODM and Pentagon. It is assumed that the Budget Bureau will okay it.

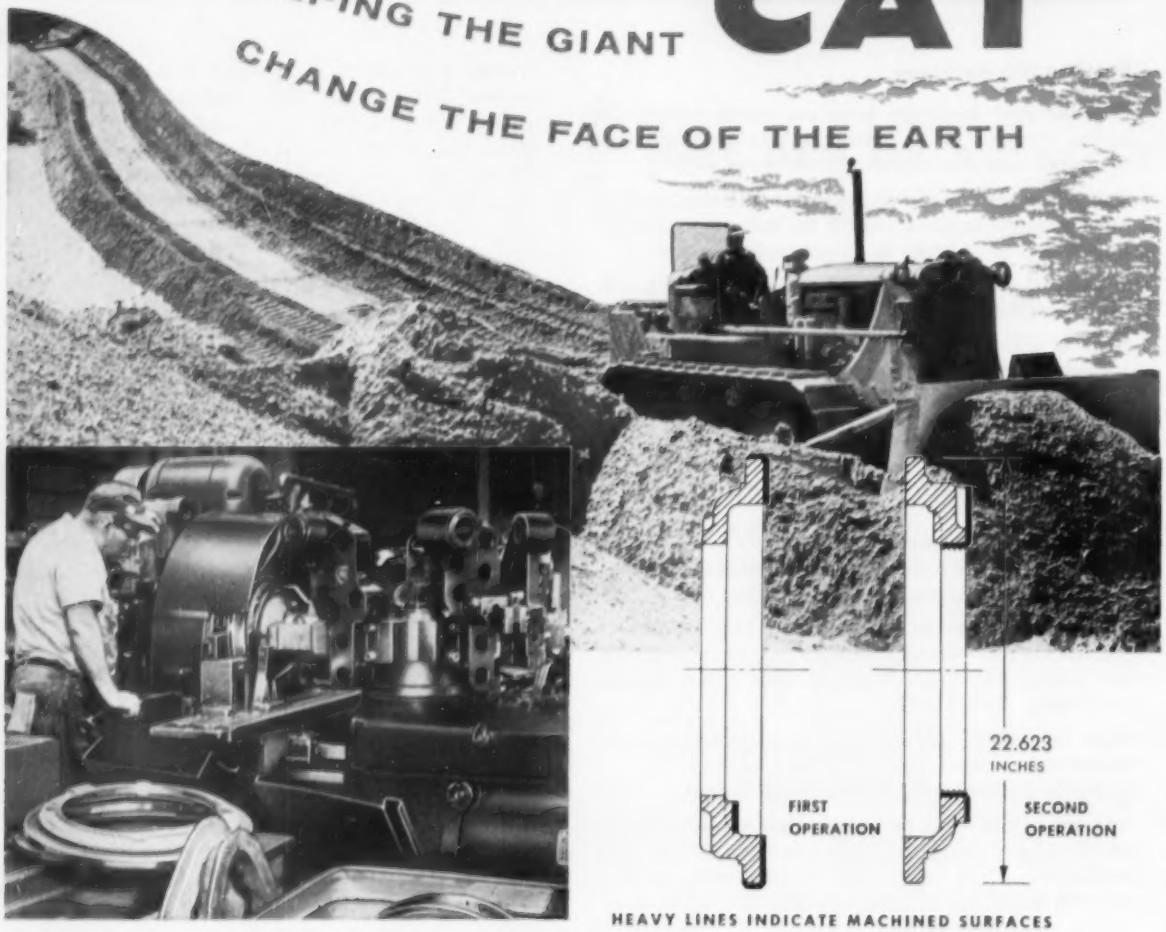
GSA will receive around $50 million from the Defense Production Act Borrowing Authority to finance this program, which consists of providing reserve machine tools for use in a national emergency in producing naval vessel gear and turbine drive units.

Actual buying of the long lead-time machines involved in this program will be done by gear and turbine manufacturers.



MACHINE TOOL NEW ORDERS FELL OFF IN FEBRUARY to 290.8 from January's 389.6 on the National Machine Tool Builders' Association Index, but orders for the month were still far higher than for any peacetime month preceding last fall's Machine Tool Show. Shipments of machine tools, on the other hand, rose from 184.7 in January to 218.4 in February as builders picked up speed in whittling down backlogs

HELPING THE GIANT **CAT*** CHANGE THE FACE OF THE EARTH



HEAVY LINES INDICATE MACHINED SURFACES

The POTTER & JOHNSTON 6-DRE-40 Automatic

NAME: *Bracket Flywheel*
MATERIAL: *Steel Casting*
REQUIRED: *2 Automatic Cycles involving several precision cuts AND A 15½" – 12 N F THREAD!*

Chucking Turret Lathe Produces BIG parts like this QUICKLY, ACCURATELY and ECONOMICALLY

Virtually "changing the face of the earth" is a rough, tough job that takes rugged, built-for-the-purpose equipment like the famous CATERPILLAR Tractors. And turning out component parts for these mighty marvels is a tough job too . . . one that calls for the rugged power, extra rigidity and all-round versatility of a machine like the POTTER & JOHNSTON 6-DRE-40 Automatic Chucking Turret Lathe. **Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.*

If *you* have difficult machining jobs – and who hasn't in these days when complex parts must be produced fast – why not borrow a page from the CATERPILLAR success story. Depend on a POTTER & JOHNSTON AUTOMATIC. Get started today . . . write for full information on the P&J 6-DRE-40 and on the other Automatic Chucking Turret Lathes in the complete P&J line.

Bulletin No. 159

Precision Production Tooling for more than Fifty Years

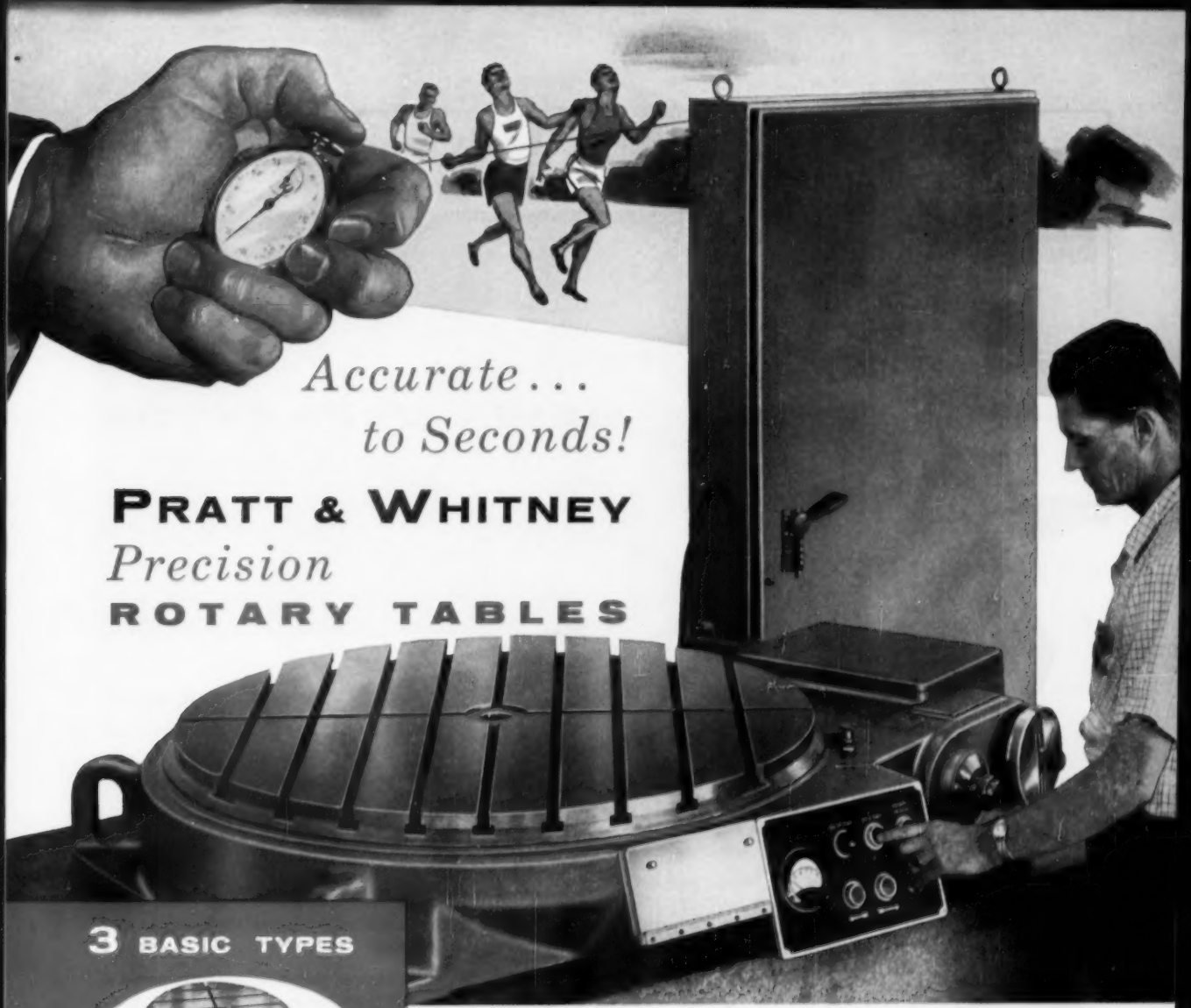
POTTER & JOHNSTON COMPANY

PAWTUCKET, RHODE ISLAND

SUBSIDIARY OF PRATT & WHITNEY COMPANY, INCORPORATED

P & W BRANCH OFFICES: Birmingham • Boston • Chicago • Cincinnati • Cleveland • Detroit • Los Angeles • New York • Philadelphia • Pittsburgh • Rochester San Francisco • St. Louis EXPORT DEPT: Pawtucket, Rhode Island AGENTS: Dallas, Southwest Industrial Sales Co. • Houston, Wessendorf, Nelms & Co.

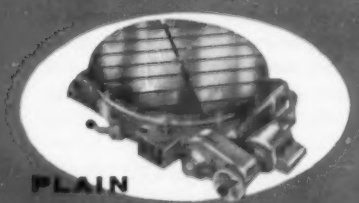
MODERNIZE WITH POTTER & JOHNSTON . . . REPLACE FOR PROFIT



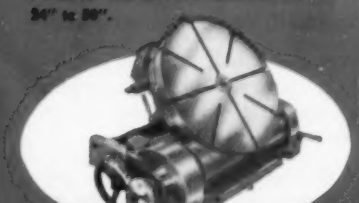
Accurate . . .
to Seconds!

PRATT & WHITNEY
Precision
ROTARY TABLES

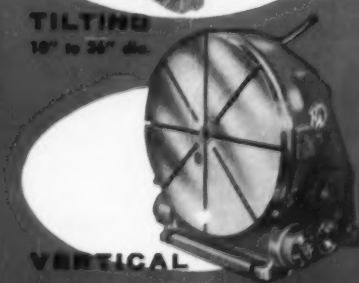
3 BASIC TYPES



PLAIN
Hand: 12" and 18" dia. Motor-Driven: 24" to 80".



TILTING
10" to 36" dia.



VERTICAL
Motor-Driven: 30" and 40" dia.

Like the timer's stop watch, Pratt & Whitney Rotary Tables are *accurate to seconds* . . . seconds of arc, that is! And they're built for ruggedness and stamina too. They'll help you eliminate expensive jigs and set-up changes on difficult, precise machining jobs year after year. Ideal, too, for reliable inspection and circular indexing.

Featured here is the latest in this advanced line . . . the new 42" Plain Rotary Tables WITH AUTOMATIC INDEXING. Work is automatically positioned to any desired angle by means of easily set dogs. Initial *and* repeat settings are made with the same dependably high accuracy.

Now . . . Pratt & Whitney Rotary Tables can also be furnished with indexing control by **numerical data.**

WRITE FOR COMPLETE INFORMATION . . . ask for illustrated circulars fully describing P&W Precision Rotary Tables.

PRATT & WHITNEY COMPANY
INCORPORATED

11 Charter Oak Boulevard, West Hartford, Connecticut

Direct Factory Representatives in Principal Cities

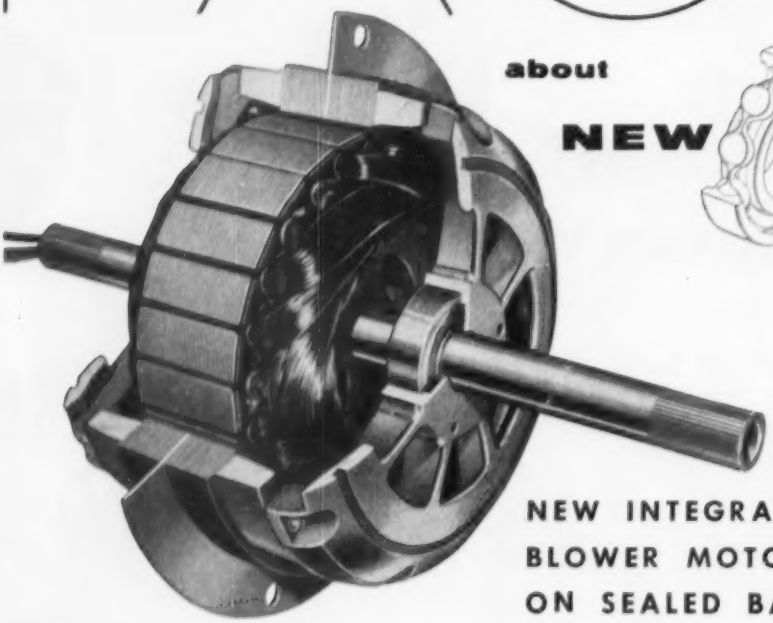
MACHINE TOOLS • GAGES • CUTTING TOOLS

FACTS

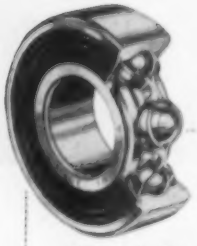
about

NEW DEPARTURE

BALL BEARINGS



NEW INTEGRAL-DRIVE BLOWER MOTOR DEPENDS ON SEALED BALL BEARINGS!



5 advantages of New Departure's Sentri-Seal ball bearings in electric motor applications

- **SEALED AND LUBRICATED FOR LIFE!** No need for relubrication; no danger of over- or under-lubrication.
- **SIMPLIFY DESIGN!** Eliminate need for separate seals and grease fittings.
- **CARRY LOADS IN ANY POSITION!** Moving parts are held in positive alignment, regardless of motor mounting position.
- **WEAR IS NEGLIGIBLE!** Require no attention for adjustment for wear. Have a reputation for outlasting the products they serve.
- **QUIET-RUNNING!** New Departure ball bearings are precision-made, run smoothly. Their uniformity is a guarantee of dependability.

Nowhere is the superiority of New Departure sealed ball bearings in electric motor applications better exemplified than in this new integral-drive blower motor.

Revolutionary "inside-out" design of this new motor imposed a lubrication problem solved by the permanent-lubrication characteristic of the finest sealed ball bearings. In this motor, the rotating element, to which the blower wheel is attached, is on the outside and revolves around a stationary shaft through which the lead wires pass. "Sealed and lubricated-for-life" New Departure ball bearings were selected because they assure permanent lubrication, regardless of centrifugal force. Also, because motor and blower wheel share the same permanently lubricated bearings, this integral unit is free of the need for periodic servicing.

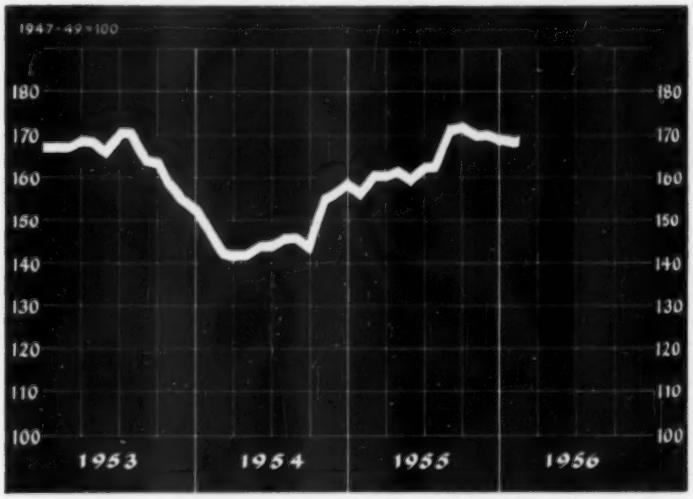
Equally important, New Departure sealed ball bearings handle combination loads in any position . . . assure positive alignment of rotor and stator. This means a versatility of application for this motor that offers new freedom to designers.

Sealed ball bearings also help increase motor efficiency and reduce electrical hum. Since in ball bearings wear is so slight as to be entirely negligible, designers were able to build in a smaller precision air gap, which is maintained throughout motor life.

Let New Departure's unexcelled engineering service show you the many advantages of sealed ball bearings in electric motor and other applications.

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONN.

Gaging Metalworking . . .



AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

169

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	MAR Esti-mated	FEB Pre-liminary	JAN Re-vised	FEB Year Ago
Total index.	**169**	**169**	**170**	**157**
Machinery	**148**	**147**		**125**
Electrical Machinery	**191**	**196**		**187**
Autos	**138**	**152**		**152**
Other Transportation	**314**	**298**		**273**
Other Metalworking	**139**	**140**		**129**

Things are looking up . . .

U S industry is picking up steam. While statistics, because of the time lag required to compile them, indicate that we're still more or less in the leveling off period from '55's boom, reports from the field in metalworking indicate a decided uptrend in durable goods sales.

For one thing, the auto people are a lot happier than they were at the beginning of the year. Cars are moving well in dealers' showrooms, even though the automakers continue to cut back output.

Reason for this paradox is that the industry overproduced itself at year's end. Now it has to underproduce to whittle down dealer stockpiles. When that happens, auto production will move up. And it'll carry a vast number of supplier industries along with it.

By the end of the year, industrial production could easily surpass 1955's record.

Some industries are doing much better than they did last year. There's the plumbing equipment industry for example. One of the biggest producers reports sales in the first two months of 1956 running 20% ahead of comparable 1955 months.

Demand for railroad locomotives is just about double that of a year ago, some major manufacturers report.

And railway freight car output would run well ahead of last year except for one thing—builders can't get enough steel plate to make a real dent in their backlogs, which are biggest in years.

One manufacturer says his freight car backlog today is 10 times what it was a year ago. But incoming orders have dropped off to two-years-ago level because the railroads figure this way: Why bother to order when the car builder can't get enough steel to fill the order anyway?

Steel is the key to today's economy . . .

It seems everybody wants more steel these days, with the appliance industry and other booming metalworking segments taking up any slack resulting from auto cutbacks.

This has placed the automakers in a funny position. After pulling in their horns on steel orders at the beginning of the year, some of them have noted with pleasure that the public is buying cars and eating into tremendous dealer backlogs.

Figuring they'll be ready to up production in May or June, some of them have come around to the steel producers to change their minds about cutting back steel orders. They've been told "Sorry, your steel has been allocated to other industries."

While the mills are operating in the neighborhood of 99-100% of capacity, shortages of plate and structurals still show no sign of improvement.

In fact, if they were to ease up, the railway rolling stock and a lot of widely diversified industries could jump their output fast—and there's no telling what lift it would give to the economy.

Manufacturers' orders pouring in . . .

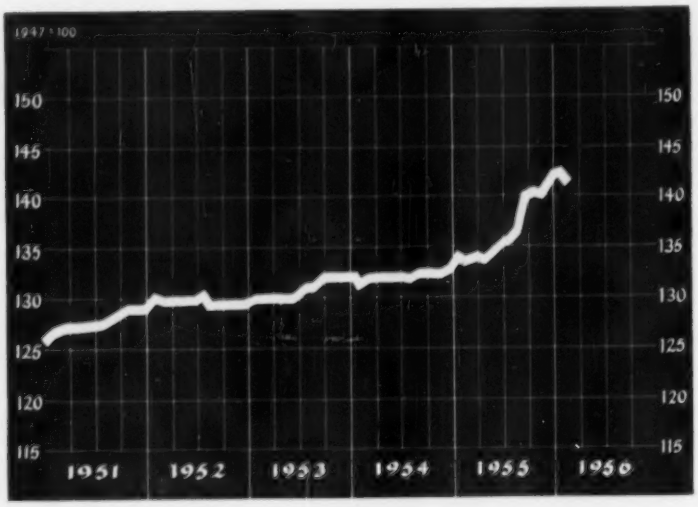
After a beginning-of-the-year lull, manufacturers' new orders have taken a sudden spurt—in most cases unexpectedly. A rise in new orders is always a harbinger of good business to come.

So is good tool and die business. Chicago's highly diversified shops, for instance, are working 45 to 50 hr weeks to cut down backlogs, and, incidentally, to give hard-to-get tool and diemakers a chance to get some of the overtime pay they've been missing in recent months.

Gaging Business . . .

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	MAR Estimated	FEB Preliminary	JAN Revised	FEB Year Ago
Total Index	**141.8**	**141.6**	**141.5**	**134.2**
Metalworking Machinery	161.4	160.9	145.9	
Other Machinery exc. Electrical	148.3	148.1	138.8	
Electrical Machinery	138.1	137.8	131.9	
Fabricated Metal Products	136.0	136.0	130.6	



1956—Another record year . . .

This is going to be the biggest year ever—in terms of industrial production, Gross National Product, profits, wages and take home pay.

This is an abrupt change in tune from widespread earlier predictions that 1956 would be "good" but not as good as record 1955.

There'll be some wobbly segments for a few months—like industrial production, which is expected to fall off from 143 (current level) to 140 in the next few months. But economists are now predicting that when the year winds up it will be well ahead of the beginning of the year.

The same thing goes for U S Gross National Product. While it's not sure that it will have topped the $400-billion level in the first quarter, by year's end it will be considerably over that level—may well be pegged at $410 billion by December.

Profits today are at an all time high—both after-tax profits and pre-tax profits. This year after-tax profits of corporations may run well over $22 billion, compared with 1955's $21.6 billion, and 1950's $22.1 billion, the previous peak year.

Costs of Materials and labor are up over a year ago, but prices are up, too. Consumption of goods and services is so heavy that there's some question about supply matching demand. This is true in spite of the tremendous additions to U S industrial capacity since Korea's end.

Wages will go up another 5% on the average this year—over and above a 5% gain in 1955. The steel union is going to ask for a lot more than just 5%, may settle for a lot more, too. A large segment of U S industry will follow the pattern of the steel settlement. And the forcing of some low pay industries to pay a $1-an-hour minimum for the first time on March 1 will raise the salary level substantially.

Workers' take-home pay will be higher than ever. Wages will be up, workhours will stay high, while cost of living will go up only a little. So far it's stayed pretty steady for a year or so.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-49 = 100)*	148.7	148.9	140.5
Steel ingot production (thousand tons)	2,400	2,449	2,278
Electric power output (million Kilowatt hours)	11,134	11,133	9,907
Production of automobiles and trucks	167,612	167,014	217,347
Engineering construction awards (Eng. News-Record, millions)	$459.5	$501.3	$335.8

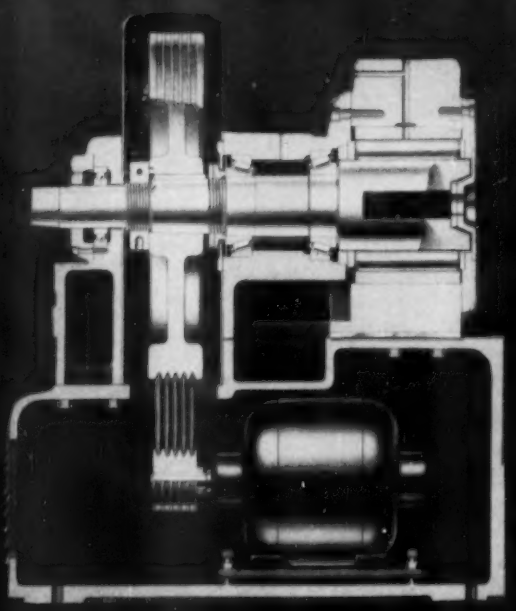
MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	292	313	382
Vacuum cleaners sales (thousands of units)	302	243	250
Washers sales (thousands of units)	392	357	357
Household electric ranges sales (thousands of units)	110	118	137
Radio production (thousands of units)	1,079	1,786	1,068
Television production (thousands of units)	588	605	655
Gear sales index (1947-49 = 100)	245.5	245.5	140.2
Foundry equipment new orders index (shipments, 1947-49 = 100)	195.6	183.9	81.0

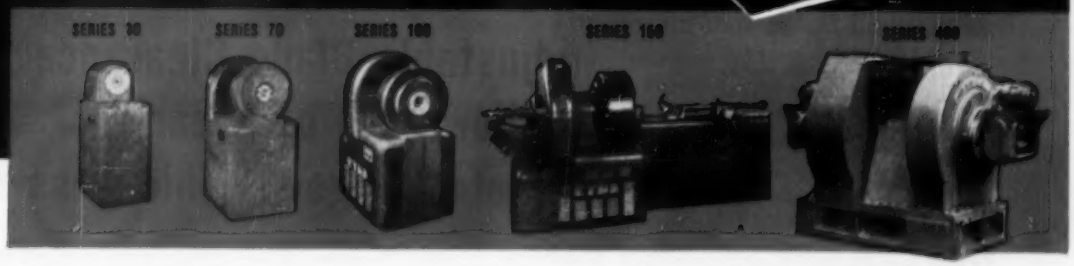
* Seasonally adjusted

IF IT'S SWAGING... It's Etna..

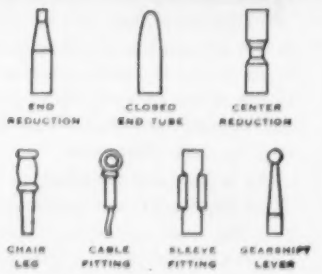
FOR CONTINUOUS PRECISION PRODUCTION



A COMPLETE RANGE OF SIZES AND CAPACITIES



For tapering, sizing, reducing and forming to special shapes of round solids and steel tubing, the Etna Swaging Machine offers the ultimate in modern machine design. Regardless of size and description of the job to be done, there's an Etna swager right for *greater production*. Write today regarding your specific job problems.



It's New! Get full information on the blending into the wall of I. D. Bead on steel and stainless steel tube with Etna Swagers resulting in mirror finish. Bead also removed on conduit.

Abbey ETNA Company

3404 MAPLEWOOD AVE., TOLEDO 10, OHIO

Shearing capacity of this machine is 12'-0" x ½" mild steel. Note accessibility of two cranks on right end housing. Upper crank is for knife adjustment. Lower one is for back gauge adjustment.

Vinson Steel and Aluminum Co. Dallas, Texas says:

Adjustable Blade Clearance Allows Use of Shear for Complete Range of Thicknesses

THE feature that Vinson Steel and Aluminum Company likes best on their Steelweld Shear is the adjustable blade clearance. This permits them to use the one machine for their complete range of thicknesses. They go as low as 26 gauge galvanized material and up to ½ inch mild steel and ½ inch aluminum.

As a leading supplier of metal in North and West Texas, Vinson insists on cuts being sharp, straight and accurate. This requires that the blade clearance be correct for every thickness cut. Because of the unique easy method of adjusting the clearance on Steelweld Shears, the adjustment can be made in seconds.

Another item which is impressive is the low maintenance cost. This machine has been in service for over two years, and the maintenance has been practically nil.

More and more warehouses are installing Steelweld Shears. Usually one will handle a range of work that would require two or more other type machines not built with a fast knife adjustment feature.

GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

1452 EAST 282nd STREET, WICKLIFFE, OHIO

STEELWELD PIVOTED BLADE SHEARS

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

The Cincinnati Plan

The Russians are out to break a monopoly long enjoyed by America, the monopoly of a high standard of living.

They are confident of making rapid progress toward atttaining their ambition through their new Five-Year Plan. This plan puts increased emphasis on technical education.

The Soviet is graduating . . .

as many as 50,000 engineers a year. Her leaders recognize that well-trained technicians in large numbers are essential if Soviet industry ever hopes to come near, or possibly equal, ours.

As Russia thus prepares for industrial expansion, the British government has announced a five-year program for increasing the facilities of its technical colleges. It wants as soon as possible to enlarge the number of advanced students from 9500 to 15,000 a year.

Though students in science and technology at British universities have doubled since 1938, the government says that "this is nothing like enough." It favors increased use of "sandwich courses." To uninitiated Americans, sandwich courses are similar to the cooperative plan in some US universities.

The British government . . .

has given assurance that its five-year program for expanding technical education facilities will be exempt from cuts, delays and postponements. The reason is that the program is felt to be essential to Britain's economic prosperity.

These ambitious programs give an added fillip to the 50th anniversary of cooperative education to be celebrated at the University of Cincinnati April 19-25. The cooperative plan was originated at Cincinnati in 1906 by the late Dean Herman Schneider of the Engineering College.

While an instructor at Lehigh, Dean Schneider asked himself the question, "How can theoretical knowledge and first-hand experience be combined?" It was not until he became dean at Cincinnati that he found the answer: by beginning a student's part-time employment during college years and making his work a recognized part of his educational program.

The Cincinnati Plan, which calls alternately for seven weeks in the classroom and seven weeks in industry, has been adopted by 33 other colleges and universities in the years since 1906. Cincinnati itself has extended "co-opping" to applied arts and to business administration.

Some 500 companies now participate in Cincinnati's co-op program (General Motors, Ford, General Electric, du Pont, to name only a few). Around 3000 students "co-op" in 75 industrial centers in 12 states.

The cooperative plan of education . . .

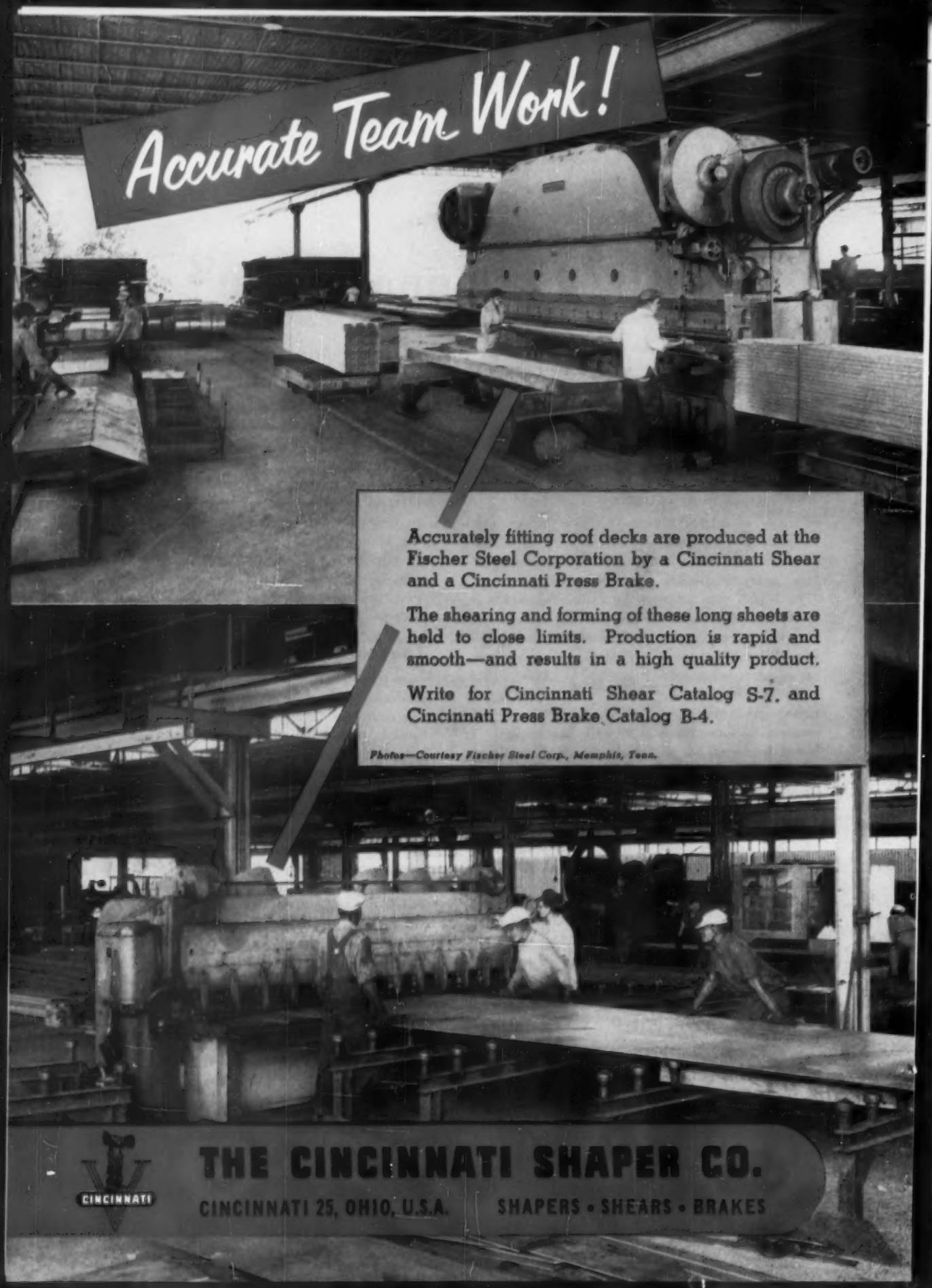
gives tremendous aid to industry in three ways: 1) It produces qualified specialized manpower at an early age ready for industrial careers; 2) it shortens the break-in period in industry; and 3) it considerably reduces the turnover of specialists in the years immediately following graduation.

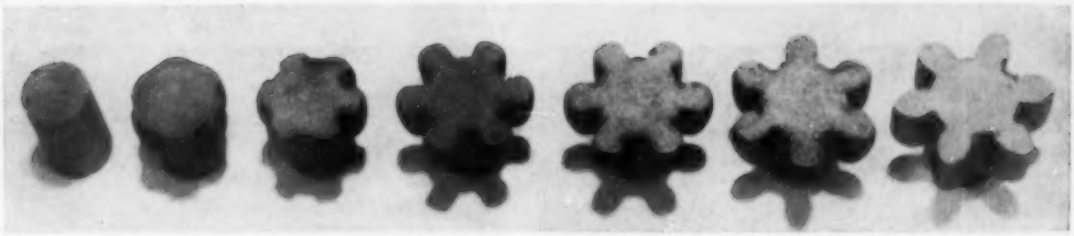
The celebration at the University of Cincinnati will help to pinpoint the contributions of technical education to the amazing growth of industrial America. It is especially appropriate for this celebration to be staged just now, when Russia is stressing the part played by engineers and technicians in its Five-Year Plan and Britain is straining to produce more technical graduates than ever before, especially by the "co-op" method, to protect her standard of living.

As we hail the University of Cincinnati on the 50th anniversary of its inauguration of the cooperative plan, we urge even wider adoption of the plan by America's institutions in an effort to meet the painful shortage of engineers and technicians and to assist in maintaining our standard of living of which Soviet leaders are so envious.

Burnham Finney

EDITOR


Accurate Team Work!
Accurately fitting roof decks are produced at the Fischer Steel Corporation by a Cincinnati Shear and a Cincinnati Press Brake.
The shearing and forming of these long sheets are held to close limits. Production is rapid and smooth—and results in a high quality product.
Write for Cincinnati Shear Catalog S-7. and Cincinnati Press Brake Catalog B-4.
Photos—Courtesy Fischer Steel Corp., Memphis, Tenn.
CINCINNATI
THE CINCINNATI SHAPER CO.
CINCINNATI 25, OHIO, U.S.A.
SHAPERS • SHEARS • BRAKES



A half second and a single press stroke carry the heated blank at left through these stages to the finished pinion at right with minimum flash, showing . . .

How superalloys are forged

- **to close tolerances**
- **without waste or scrap**
- **with improved physical properties**
- **and lowered product cost**

Precision control of forging temperatures, accurate presses, and good tool design are required to forge titanium, zirconium, and the superalloys to nearly finished size. Several years of pioneering work led to these methods, as told to George H De Groat, associate editor, by . . .

JOHN E CONNOLLY, president,
SUPER ALLOY FORGE, INC. HAMBURG, MICH

American Machinist

Working as close as 50 F below the melting point, and controlling temperatures within 10 F in some cases—these are the secrets of a new technique specifically developed to improve production of parts from expensive, strategic materials. Precision temperature controls, accurate presses, induction heaters, and other instruments and equipment make this control possible at Super Alloy Forge, Inc.

Prime purpose of the company is the working of expensive strategic alloys rather than the more common materials because the biggest advantages of the process are the savings gained in eliminating excessive finishing stock and expensive machining operations. With some of the newer high-alloy materials now available to industry—particularly the vacuum-melt alloys—scrap cannot readily be reclaimed. With this process, yield (the amount of material ending up in a finished part relative to the amount of raw material put in) is nearly 99%.

As a specialist, Super Alloy Forge Co concentrates on precision forging and works such materials as Haynes Alloy No. 25 with 51% cobalt, 10% nickel, 2% iron, 20% chrome, and 15% tungsten. A multi-element base material handled here is Haynes Multimet, made up of 20% cobalt, 20% nickel, 30% iron, 21% chrome, 2.5% tungsten, stabilized with 1% columbium plus tantalum. Haynes Alloy 2235 is one of the nickel-base alloys forged and includes 1% cobalt, 64% nickel, 9% iron, 15½% chrome, 6% moly. Titanium 150-A includes 2.8% chrome and 1.5% iron. Cost of these alloys runs from 10 to 150 times the cost of more common steels and alloys

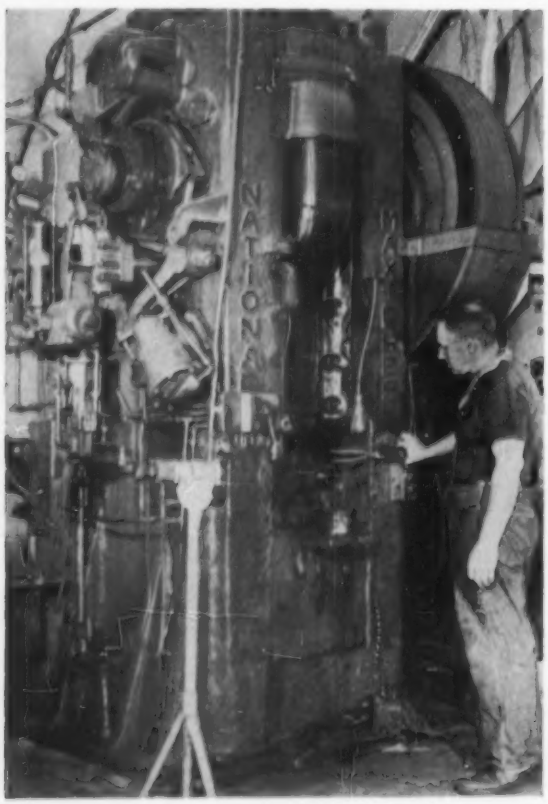
INDUCTION HEATING

Reaching an optimum solution condition—to per-

How superalloys are forged . . .

CRITICAL ALLOYS ARE PRECISION FORGED to make a wide variety of heat- and corrosion-resistant parts. Pistons are 150-A titanium, valves are zirconium, and nuts for chemical vats are Hastelloy C. Also shown: a tungsten reflector for an electron microscope, initiator tubes for jet aircraft seat ejectors made of 4140, (upper left) and Multimet exhaust valves for railroad diesels

FIRST STEP IS INDUCTION HEATING slugs to be forged. Close temperature control and special coils, designed to suit individual blanks, insure forging at temperatures close to melting point of the alloy

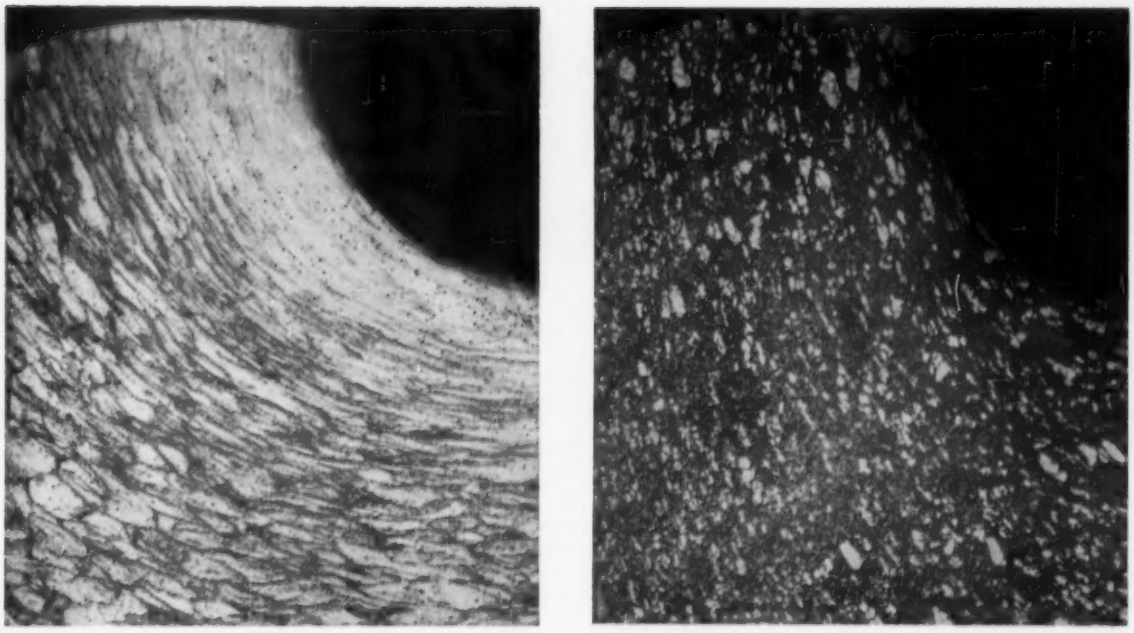


mit forging at the most plastic state—is the first step in the process. This involves heating the alloy blank with specially designed induction coils in a 30-kw unit. Coils are developed for each part and include tracks that guide the work through without cooling the contact surface. It is essential that the temperature of the blank, or slug, be absolutely uniform throughout, or temperature variations will create differences in the forged microstructure.

Temperature control, maintained largely by a Leeds & Northrup Rayotube connected to a Speedomax recorder with special instruments and amplification, is correct within 0.5%. Induction heating produces scale-free work—essential to accurate radiation pyrometer readings as well as for good die life and work finish.

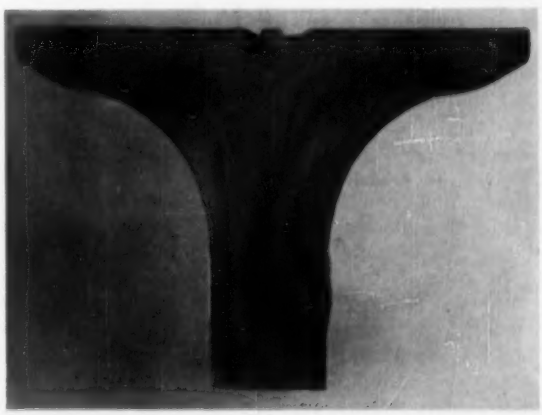
Curves indicating the plasticity of various alloys just before the melting point have been developed on the basis of long experience. These curves are employed for making prototype parts to minimize trial and error runs and resulting scrap. In many cases, good work is produced with the first shot—a real advantage in dealing with expensive materials.

ACCURATE PRESSES ARE ESSENTIAL to precision forging. Ram on this 350-ton Maxipres weighs over a ton, hits die within 0.002-0.003-in. accuracy, through suspended-slide construction. Fast acting, high-impact single blow on hot metal forms the part in one stroke—at the optimum forging temperature—in less than ½ sec



GRAIN STRUCTURE AT FILLET RADIUS of 6-tooth gear demonstrates metal flow obtained by forging at elevated temperatures. High tooth strength results, and finishing operations are minimized by small amount of flash. Left, grain structure of gear made of Ti-148 titanium; right, same gear made of Duronze III (91% copper, 7% aluminum, 2% silicon.)

Although automatic loading equipment can be employed to handle hot blanks from the induction coil to the die without significant heat loss, skilled operators do equally well on short-run work. These men are capable of transferring parts at a uniform rate with a heat loss of no more than 30° at 2250 F. Knowing exactly what this loss will be for any material and working temperature, compensation can be made. Because induction heating permits controlling a heat gradient from the surface of a blank to the core, the outside shell is brought to the higher temperature needed to compensate for heat loss in transfer. As a result, the blank has a uniform temperature throughout at the time of forging impact.



METAL FLOW at temperatures providing optimum solution is evident in this bad piece of scrap titanium, deliberately forged to check results. Poor structure is refined and improved by the process. Note pipe extruded into valve stem

HIGH-SPEED IMPACT

Second step in the process is a single-blow impact on the hot blank in an inclosed die. Working at a plastic state just below the melting point permits working pressures much lower than those used conventionally.

The process is, to some extent, similar to volumetric cored forging—and might be referred to as controlled volumetric inclosed-die impact extrusion. Only one blow is struck — restrikes are usually avoided because the time involved in making two or more would permit heat losses to reduce plasticity, or, the optimum solution condition. Time for most work is less than ½ sec in dies heated to about 250F to avoid thermal shock. A controlled amount of heat is employed at the die to avoid overheating. This condition would be detrimental to the lubricant—another important element in the process —because oil breaks down under pressure and high heat.

Numerous lubricants have been tried, and experiments with mica, glass, and others are still being carried out. For most purposes however, a graphite suspension in oil is employed with each shot. Aquadag, a colloidal suspension of molecular parti-

How superalloys are forged . . .

UNUSUALLY HIGH REDUCTION is obtained in forging a zirconium valve, top, where a 20 to 1 ratio was obtained. Hastelloy B ball, at right, for chemical processing valves is about 2¾-in. dia, made from a 2½-in. dia bar in one shot. Initiator chamber was made of a relatively low alloy, 4140, in two strikes—one for squaring the bore with the OD, the second for finishing

JET-ENGINE BOLTS are forged from Hastelloy R-235. Stem density is compared here with structure of low-carbon steel, left. Center part was forged at 2000F, bolt at right at 1950F. Bolts are also made in this manner from Nimonic 80-A with equal density and precision

cle size is applied to the die initially to close all pores. This coating is applied at 300 to 400 F before the die is set up in the press.

DIE DESIGN IMPORTANT

Tools are made of hot-work die steel, hardened, ground and polished. Because of the extreme abrasiveness of many of the alloys—particularly titanium—sectional construction is employed. This permits easy replacement of portions most subject to wear. At the elevated temperatures used, die life cannot be said to be good in any case at present, but savings in expensive materials and other advantages of the process outweigh this disadvantage. Die life is also dependent upon the material being worked as well as the tolerances on the part. Part dimensions change as the die wears, necessitating frequent replacement if close tolerances are to be held.

In general, tool construction is similar to that employed for powder metallurgy in that the die is shaped to perform to the desired contour in the part and has two mating punches. Die contour dimensions are made to the finished part size, allowing for normal forging shrinkage. The hot blank is undersize so that it flows and fills out the cavity under impact.

Progressive improvement in grain structure is gained by forging Ti-150-A titanium at different temperatures. At 1450F, grain structure is coarse and slip planes are evident. Forged at 1500F, the piece shows less evidence of slip planes, more moderate grain structure. Fine grain structure and no slip planes were obtained at 1600F, with 220,000 psi tensile strength after heat treat. All were forged under identical conditions except temperature

Usually limits on forged parts are sufficiently liberal to permit relatively wide tolerances in the tools but close tolerances can be held when necessary. Normally, radial tolerances of 0.010 in. can be held and where parts must be made within tolerances as close as 0.003 in., forgings are sand-blasted and then cold coined to size in carbide dies. This increases costs, but eliminates more secondary operations in many cases.

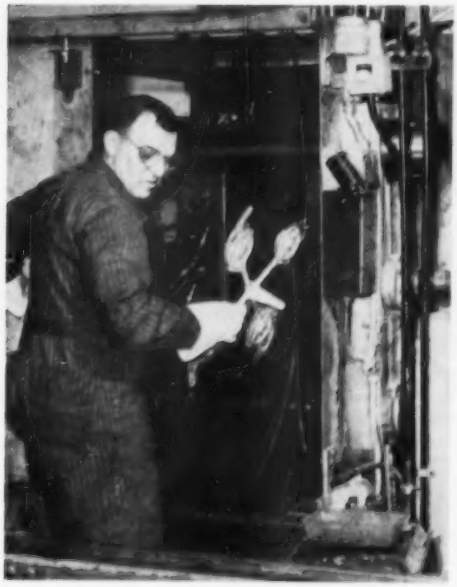
Tool dimensions can be held as close as a broach can be made for producing the die contour or as close as mating punches can be ground. Where long runs are anticipated, a number of extra die blanks and punches are made. This permits quick replacement as wear occurs so that a high degree of accuracy is maintained in forged parts throughout the run.

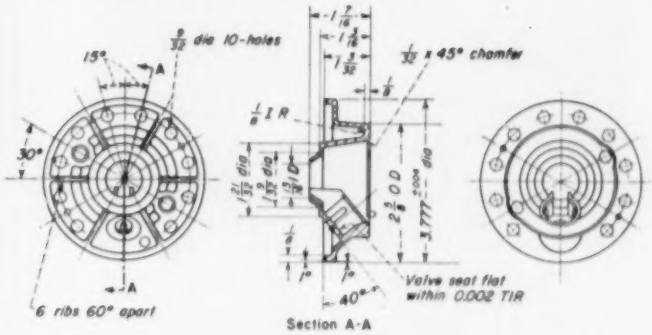
For high-volume production, chrome-carbide dies are employed to advantage although, here again, cost is an influencing factor. As with many other processes, the economics of the method must be considered: high tool cost compared with savings gained in conserving expensive materials, or the gains made by eliminating extra operations, or the advantages of product improvement.

In this respect the process is best suited to forging costly materials where the relatively high tool cost is quickly absorbed. Titanium and zirconium, together with their alloys, almost immediately accomplish this end. Rotors for chemical pumps are forged of Hastelloy Alloy C, for example, ready for finish grinding. This is done by precision forging at 2250F—68° below the melting point. As a result, die costs are considered negligible compared with the advantages gained in this particular application.

Although lower alloys are forged advantageously —being worked below the scale point with combined high strength and good surface condition—savings in materials are not sufficiently high to justify present high tool costs.

FIRST APPLICATION OF HOT-CHAMBER MAGNESIUM DIE CASTING . . NO. 1





ABOUT 240 SHOTS PER HOUR are made in this Cast-Master setup for die casting magnesium oil-filter bypass valve bodies with the hot-chamber process. All mounting surfaces are finished as cast—no machining is required except deburring, removing flash, and producing one counterbored hole. Completely hydraulic machine is operated by fire-resistant fluid and applies 1900-psi injection pressure, 500-psi clamping pressure at the die. Four-cavity die produces a cluster of parts weighing about 1.5 lb, ejected within 4 sec after each shot to prevent complete cooling and shrinkage on the cores which might result in shrinkage cracks

Problems were to prevent oxidation, maintain good density, eliminate tool corrosion, and be sure of good safety practice. Result is . . .

4 magnesium parts cast in 15 seconds

Production can be increased, cost cut, when magnesium is die cast by the method traditional for zinc. Laboratory success was first reported about 16 months ago (AM—Dec 6 '54, p194). The first two industrial applications of the new process are at AC Spark Plug and Redmond Corp, the latter utilizing the Dow pilot plant. Here, in two articles are details of these applications. The first article concentrates on how the die casting is done, the second on the cost and changes in other operations resulting from change to magnesium die casting

HARRY ERIKSEN, supervisor, Production Engineering
and CLIFFORD JOHNSON, superintendent, Die Casting
AC SPARK PLUG DIVISION, GENERAL MOTORS CORP,
FLINT, MICH

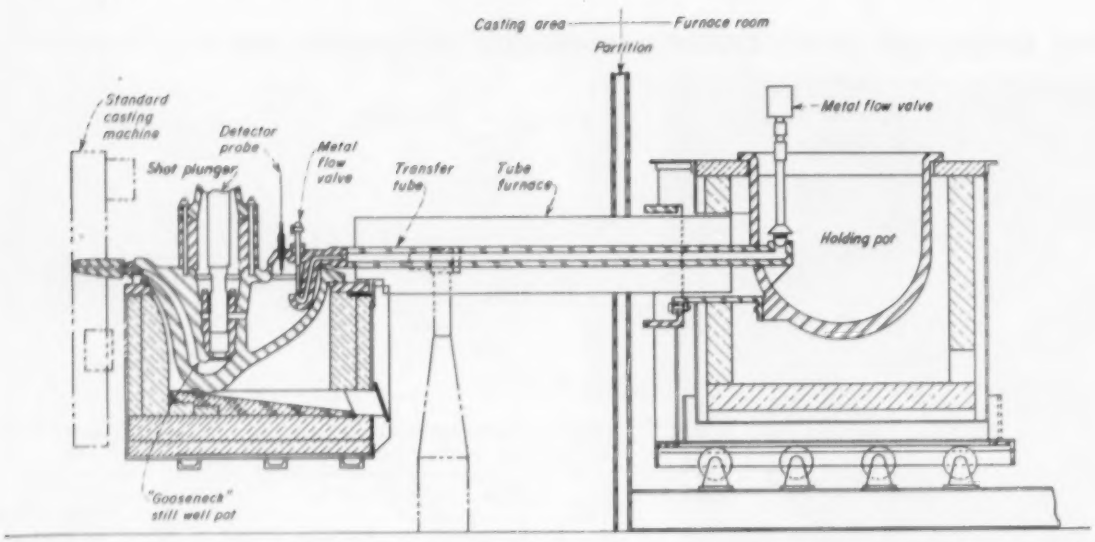
New low hood designs in current car models inspired AC Spark Plug to investigate magnesium for fuel-pump bodies, filter valves, and other parts. Heat concentration in the smaller area under these hoods makes the low heat retentivity of magnesium an advantage.

Manufacturing advantages include production of more pieces per pound with the lighweight material so cost per piece is lower, even though the price per pound is higher. Lower weight reduces operator fatigue in handling the parts, and also cuts shipping costs. In addition, machinability is better than that of zinc.

AC engineers were aided considerably by Dow Chemical Co, where hot-chamber die casting of magnesium parts has been developed on an experimental and limited production basis. Now, AC Spark Plug, under a license agreement with Dow, has the first outside application of the process in operation.

MATERIALS THE MAIN PROBLEM

In the hot-chamber process, the gooseneck (pressure chamber) is submerged in the molten metal to be cast. Therefore, the pressure chamber reaches the temperature of the metal cast. In the cold-chamber process, the metal is ladled into the pressure chamber for each shot. Contact of the hot metal



HOT-CHAMBER DIE CASTING OF MAGNESIUM is new in industrial applications, although process is widely used for zinc. In contrast to cold-chamber casting, where metal is hand ladled into the pressure chamber for each shot, here molten magnesium is contained in a Stillwell resistance furnace at a temperature of 1200 F. A plunger in an integrally cast pressure chamber, or cylinder, is 3.5 in. in dia and automatically forces metal into the die. Level of metal in the furnace is maintained to avoid temperature differentials caused by large changes in volume. To achieve a constant level, metal is automatically admitted after each shot from a holding pot

with the chamber is of short duration and the pressure chamber does not reach the temperature of the metal. Because standard ferrous alloys soften appreciably above 1100 F, the hot-chamber process has been restricted to zinc and other low-melting-point alloys.

Magnesium, unlike aluminum, does not attack ferrous alloys rapidly, so the main problem involved was to find a material which would retain hardness at 1200 F and which could be used for the close-working plunger and sleeve assembly. Materials finally employed for these members lengthened tool life to a point which made the hot-chamber process practical for magnesium.

Principal aim throughout the plant is to achieve integrated processing with bar stock or other raw materials proceeding from beginning to shipping cartons smoothly and efficiently. This aim is achieved at the die-casting setup where AZ91B magnesium ingots are melted, transferred as molten metal to a holding furnace, then fed through a resistance-heated tube to the gooseneck pot, or "Stillwell." Temperatures in the transfer tube and Stillwell are maintained at approximately 1200 F. A model B-20-M Cast Master machine is employed for casting.

900-LB MELTING FURNACE is used to refine ingots and scrap. From here the molten material goes to an adjacent holding furnace, then to the machine through a gravity-operated transfer tube with a level-indicator control. Both the machine furnace and holding pot ride on casters in tracks to permit movement caused by expansion and contraction as well as to permit adjustment at the injection nozzle in the die area

PRODUCTION PROBLEMS LICKED

Level of the metal in the Stillwell furnace is closely controlled to eliminate a major production problem—heat loss. Air-operated cylinders open two valves—one in the holding furnace and one in Stillwell pot—allowing the metal to flow from the holding furnace through a resistance-heated tube to the Stillwell furnace. The cycling of the valves is controlled by a level-indicating device. This level-indicating device consists of two parts, a probe assembly and the control system.

The probe assembly mounted over the Stillwell consists basically of a motor-driven geared head, a probe, and two limit switches. The device works on the basis of maintaining a constant spark gap. As metal level drops, the probe drive unit moves the probe downward to maintain the spark gap. When the probe reaches a predetermined point in its downward movement, it contacts a limit switch mounted in the drive unit. Closing this switch causes the solenoid-operated air valves on the metal-shutoff system to actuate the air cylinder and in

turn open the metal-flow system. As metal level rises, the probe moves upward to the maximum level, where a second limit switch is actuated to stop the flow. Adding metal to the Stillwell at frequent intervals reduces the change in volume to a minimum and reduces temperature differentials.

Other production problems include prevention of oxidation in the hot chamber, or melt pot. This is handled by a protective atmosphere of sulfur dioxide—maintained at 2 psi to blanket the molten magnesium surface. Dry flux is not used here because it would produce corrosion if carried into the castings. The gas, delivered from a tank mounted on spring scales, escapes through bubbler and tube to the completely covered Stillwell pot. Gas usage is very low. A 150-lb cylinder in use three months is not yet exhausted. Dry chloride fluxes used in the melting and cleaning of the metal vaporize from the heat of melting and pass into the atmosphere where they would settle out on machines and buildings unless properly handled. These vaporized fluxes are a definite problem, for they are hygroscopic and will absorb moisture from the air to form acids which will corrode metal.

This is overcome by providing a separate melting room and ventilation system. Melting-room air is exhausted through a water-wash Roto-Clone blower above the plant roof.

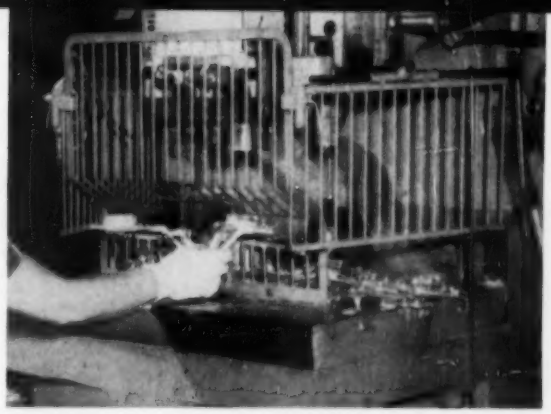
Exhausting the air from the furnace room keeps this area under negative pressure and prevents the vaporized fluxes from escaping into the general plant area. Exhausting the air through the water-wash system separates the chloride fluxes from the air and makes it possible to vent the area without fear of corrosion to plant or equipment.

DIES ARE CONVENTIONAL

Die life is generally longer in running magnesium than it is when casting aluminum, but is shorter than the life of dies for zinc. Die steels are the same as those for casting aluminum, and tool heat-treatment and procedures are similar. As in conventional practice, dies are water cooled and a standard grade of lubricant is applied in small amounts to the sprue splitter at intervals required by the job. Conventional methods for pulling cores are used, including gear-actuated cores for compound angles.

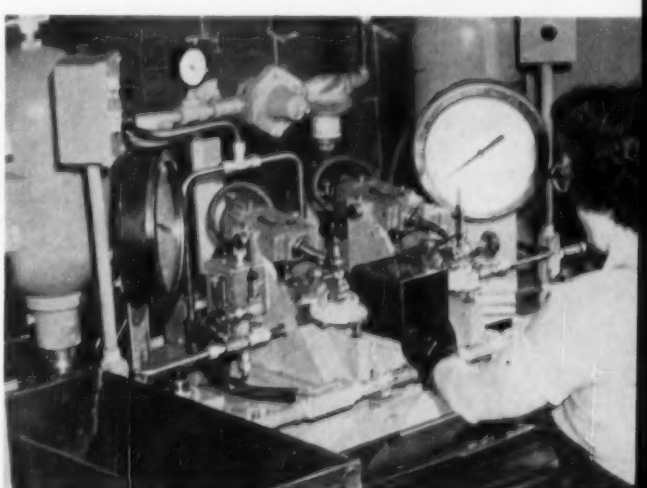
The latent heat of fusion of magnesium is low, and fewer BTU's are removed in changing from a liquid to a solid. For this reason, sprue and runners are kept short, and the die is so arranged that some areas may be cooled while others are not. No wide-area cooling lines are included.

Because of the greater shrinkage of magnesium than zinc, and because magnesium solidifies so rapidly that nearly all shrinkage occurs before the part can be ejected, it is imperative to have sufficient draft on internal surfaces to speed ejection. If dwell time is prolonged, or the opening stroke of the machine too long and the casting thereby allowed to chill in the die, trouble may be encountered with shrinkage cracks. Generous filled radii are in all corners, and abrupt changes in section thickness avoided.



TRIMMING GATES AND SHAVING FLASH from die-cast clusters is done in a No. 42 Bliss press—the first line of machines for secondary operations. Modifications to the line will include automatic processing and assembly. Current setup includes belt conveyors to carry parts from one machine to the next

ASSEMBLING VALVE COMPONENTS follows trimming all holes except those cast at angles. A drillpress setup removes flash from around the movable angle core and counterbores the seat for a washer that holds the valve spring in position. The valve seat is then coined and flash removed from the angular hole in a press operation, after which the parts are burred. In the next setup, the valve spring and retaining washer are positioned and pressed in place



TWO-STATION INSPECTION SETUP checks assembled valves two at a time. Here oil pressure is applied to open the valves at 4½- to 5½-psi pressure differential (normal bypass pressures in a car). Valves are 100% checked here for operating characteristics and for holding force of washer under 10-lb load before packing and shipping

PLEASE TURN PAGE ▶

4 magnesium parts cast in 15 seconds . . .

SAFETY MEASURES

First step in assuring a high degree of safety is to acquaint operators with the hazards. A degree of respect for magnesium —not fear—is all that is necessary to prevent careless accidents. The machine is equipped with a magnesium door, light weight for manual handling, and was designed this way to prevent automatic closing on an operator's hand or arm.

When the parting-line door is closed, a door lock is tripped and a switch closed to actuate the machine. The door lock will hold the door in a closed position until the shot is made and the plunger returned to up position. This eliminates the possibility of the door being opened inadvertently during the operation and thus protects the operator from flash. A ratchet type of safety catch is cammed into position in the first 3 in. of door opening to engage a dog, or catch, mounted on the moving platen of the machine. This safety catch is of sufficient strength to prevent the machine from closing with the parting-line door in open position.

Other safety measures include a firm rule that face shields be worn at all times in the melting room and when cleaning or observing the metal in the Still-well furnace.

Proper smothering powders, such as G-1 and magnesium flux, are readily available to extinguish any fire. Runout pans are situated under the furnace to catch the magnesium in the event of a pot failure.

Trimming scrap is reclaimed, but the finer material such as fine chips and shavings are collected in covered steel drums and taken to a safe area and burned. Pot skimmings are handled in a similar manner, and good housekeeping is maintained in the machining area where large amounts of chips and shavings are not permitted to accumulate.

600 END FRAMES PER HOUR are die cast in this hot-chamber machine at Dow. They are cast in AZ918 magnesium with a three-cavity die

Magnesium motor

Hot- and cold-chamber casting combine to save a pound of weight and eliminate a riveting operation in fractional-horsepower line

A major assembly operation was eliminated in redesigning a line of Redmond electric motors with magnesium die castings. This is the result of casting the stator core around the lamination stack, eliminating the riveting of stator rings around the stack.

The Type AY line includes shaded-pole ac motors ranging from 1/35 to ¼ hp. Previous design included die-cast aluminum end frames and die-cast zinc rings to hold the laminations of the stator core.

Both parts are magnesium in the new design. Stator length has been doubled and the core covered with a shell about 1/16 in. thick. Length of the end frames is reduced to keep total length about the same. Increased rigidity and better bearing alignment are provided by the change.

Stator cores are cast around the lamination stack in a cold-chamber machine. Magnesium was found to work well in this type of assembly operation because it does not solder to the dies, has good elongation, and little tendency to hot shortness. End frames are cast by the hot-chamber method at Dow. (This method is described in detail in the article on p 125.)

STACKS OF STATOR LAMINATIONS are placed in two-cavity die at Redmond. Magnesium stator shell is cast around the laminations at an average of 85 shots per hour

UNI-CAST CORES are removed from machine. When there is a misrun, the cast shell is stripped from the laminations and the stack is salvaged

parts are die cast

ROBERT E DRURY, director of manufacturing,
REDMOND CO, INC, OWOSSO, MICH

Comparative metal costs of the castings by the former method and the two methods now in use are shown in the table. The saving in metal cost provides a margin to cover the higher processing costs of magnesium (such as flux refining) and amortization of the casting machine.

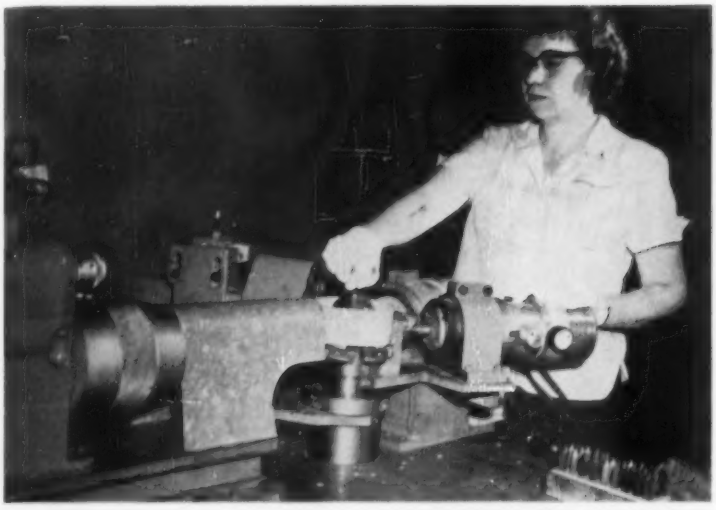
Machining operations on the castings, several of which are shown, are generally performed at the maximum speed of the machines. After six months production experience with magnesium die castings, two additional lines of motors are being designed in magnesium.

STATOR CASTINGS are machined on both ends in Heald Bore-Matic. Work speed is 2000 rpm while taking 0.020-in. cut on ID, 1000 rpm for 3/32-in. cut on OD and 1/32-in. on face with carbide tools. Feed rate is 0.008 ipr

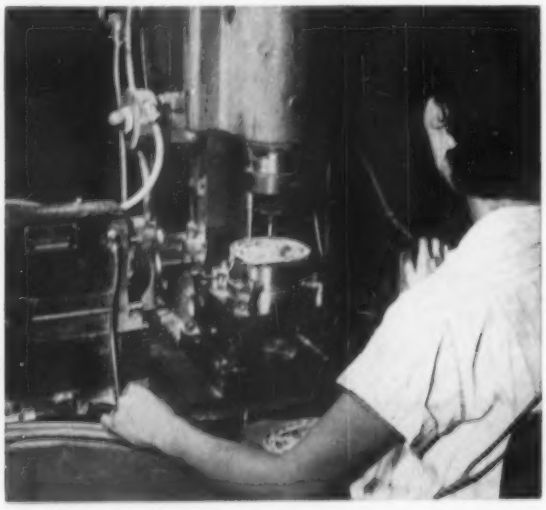
PLEASE TURN PAGE

Magnesium motor parts are die cast

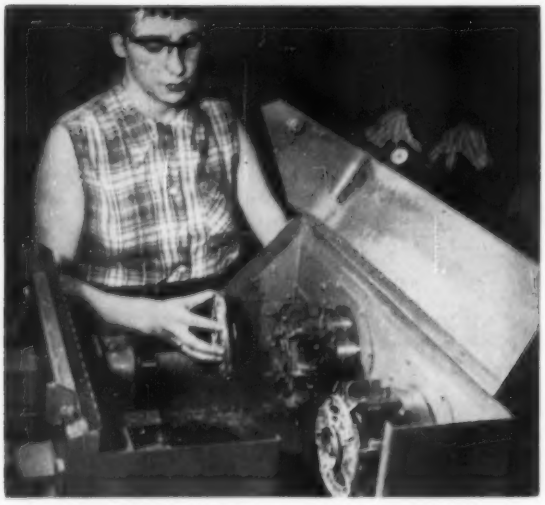
continued



DRILLING RIG FOR STATOR CORES was built by Redmond to drill two nameplate holes, two drain holes, and a lead hole simultaneously. HSS fast-spiral drills of 0.086-in. dia operate at 2500 rpm and 350-ipm feed in two Dumore heads. Similar drills of 0.250- to 0.625-in. dia operate at 1750 rpm, 280-ipm feed in two Hartford Rockwell heads



END FRAMES ARE BORED to receive bearing in this setup. Oil hole is drilled at same time by drillhead at left. Work is clamped by lever-operated collet. Boring head is advanced by hydraulic cylinder, drillhead by air cylinder, both actuated by same switch. Production rate is 270 pc per hr



FINAL TOLERANCE OF 0.0002 IN. in end frame bearing is obtained in this Heald Bore-Matic. Work is turned at 2000 rpm while bearing is bored, removing 0.020 in. at 0.004-ipr feed. In same setup, frames are faced at 1000 rpm with a 3/32-in. depth of cut on OD and 1/32-in. on face

Comparative Metal Cost* in Die Casting Motor Parts

	Zinc hot chamber	Aluminum cold chamber	Magnesium cold chamber	Magnesium hot chamber
Alloy	XXIII	SC84	AZ91B	AZ91B
Price delivered, $/lb	0.175	0.305	0.31	0.31
$100 buys, lb	571	328	322	322
Average metal loss, $ or %	2	5	20	12
Average metal loss, lb	11	16	64	39
Castings to sell, lb	560	312	258	283
Alloy density, lb/cu in.	0.24	0.098	0.066	0.066
Weight of 10 cu in. casting, lb	2.4	0.98	0.66	0.66
Castings to sell, units	233	318	391	429
Metal cost per 10 cu in. casting, $	0.43	0.315	0.26	0.23

** Note that this table covers only metal cost, not processing cost. The processing cost is higher for magnesium than for aluminum or zinc.*

14 steps TO DESIGN A DIE

STEP 5...

How to design punch plates

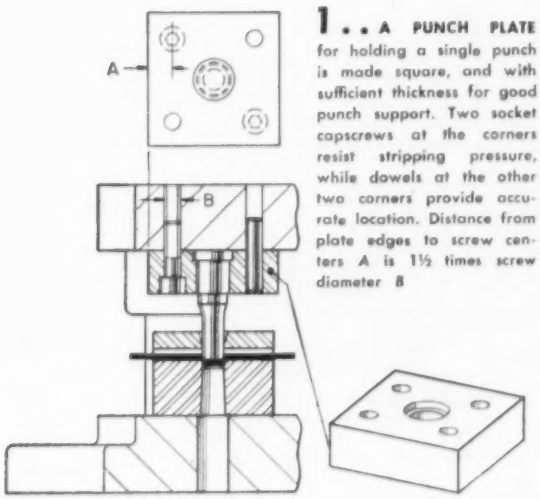
J R PAQUIN

Punch plates support piercing, notching, and cut-off punches. They are usually made of machine steel, but can be made of tool steel, left soft, for high-grade dies. Punch plates range from small simple blocks for holding single piercing punches to large, precision-machined plates for holding hundreds of perforators. Important design considerations include:

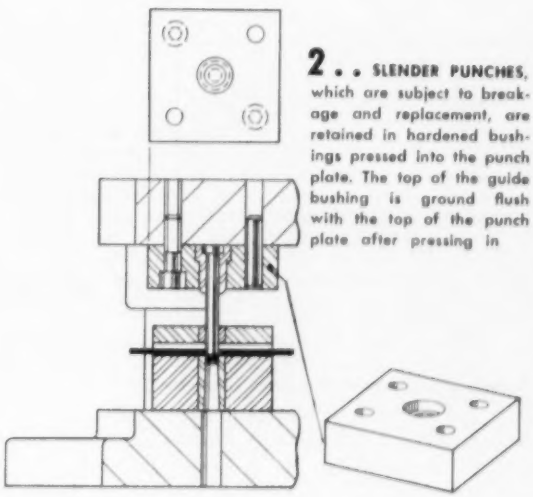
1. . . Adequate thickness for punch support.
2. . . Good doweling to insure accurate location.
3. . . Sufficient screws to overcome stripping load.

Illustrated are 20 methods of designing punch plates, and applying them to various types of dies. These methods further explain Step 5 in the 6-page insert — "Fourteen Steps to Design a Die" (AM — Oct. 10'55, p129)

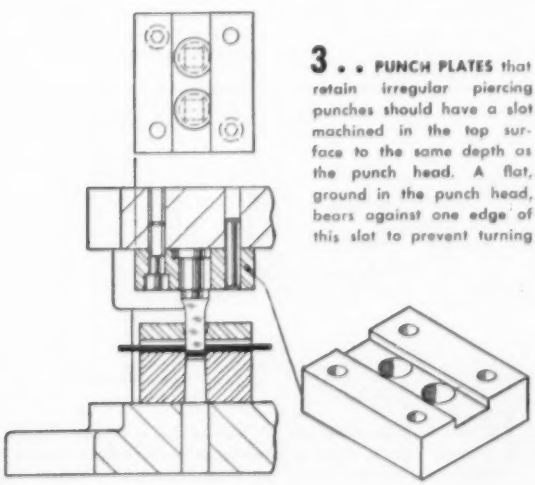
REPUBLICATION RIGHTS RESERVED BY AUTHOR



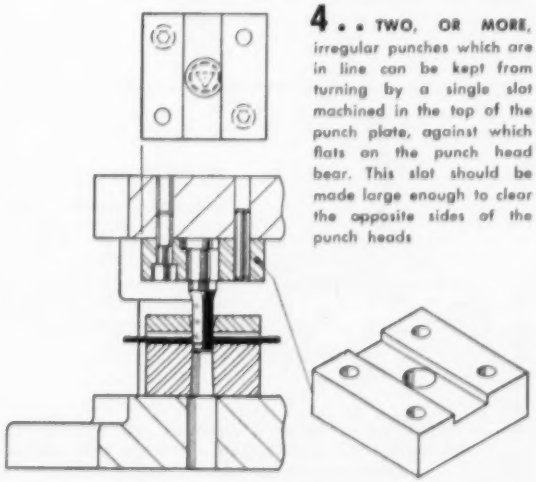
1 . . A PUNCH PLATE for holding a single punch is made square, and with sufficient thickness for good punch support. Two socket capscrews at the corners resist stripping pressure, while dowels at the other two corners provide accurate location. Distance from plate edges to screw centers *A* is 1½ times screw diameter *B*



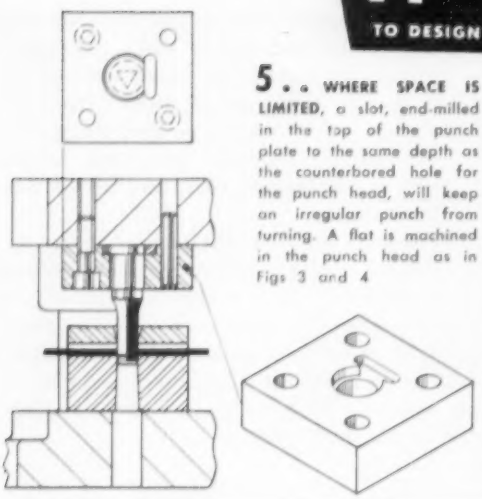
2 . . SLENDER PUNCHES, which are subject to breakage and replacement, are retained in hardened bushings pressed into the punch plate. The top of the guide bushing is ground flush with the top of the punch plate after pressing in



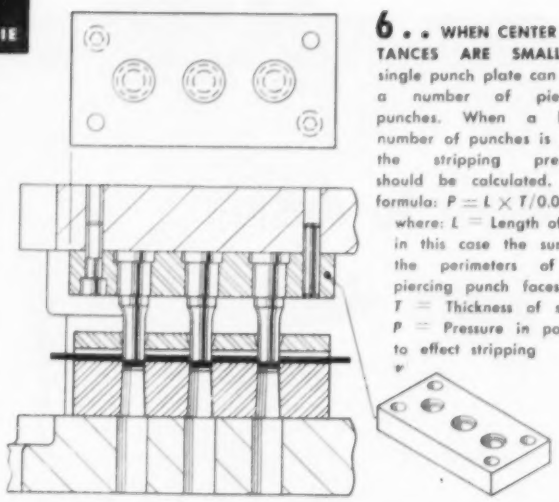
3 . . PUNCH PLATES that retain irregular piercing punches should have a slot machined in the top surface to the same depth as the punch head. A flat, ground in the punch head, bears against one edge of this slot to prevent turning



4 . . TWO, OR MORE, irregular punches which are in line can be kept from turning by a single slot machined in the top of the punch plate, against which flats on the punch head bear. This slot should be made large enough to clear the opposite sides of the punch heads

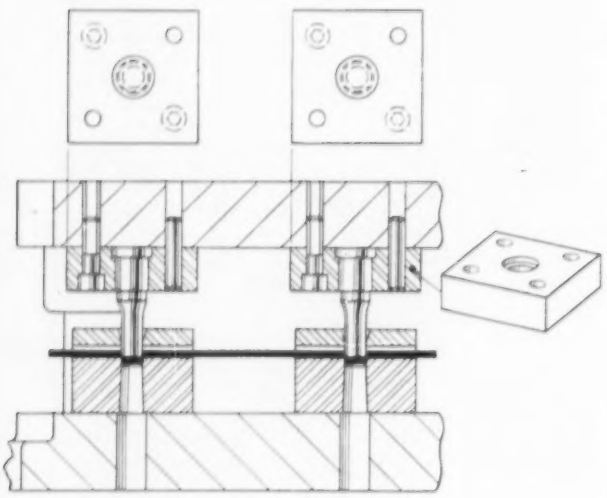


5 . . WHERE SPACE IS LIMITED, a slot, end-milled in the top of the punch plate to the same depth as the counterbored hole for the punch head, will keep an irregular punch from turning. A flat is machined in the punch head as in Figs 3 and 4

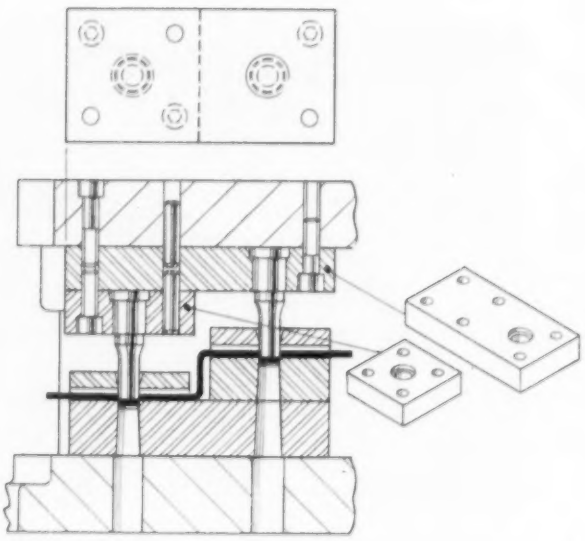


6 . . WHEN CENTER DISTANCES ARE SMALL, a single punch plate can hold a number of piercing punches. When a large number of punches is held, the stripping pressure should be calculated. The formula: $P = L \times T / 0.00117$

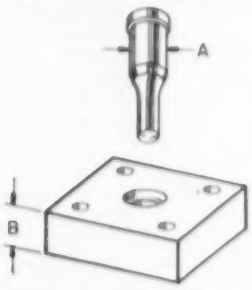
where: L = Length of cut, in this case the sum of the perimeters of all piercing punch faces.
T = Thickness of stock.
P = Pressure in pounds to effect stripping



7 . . WHEN PIERCING PUNCHES are some distance from each other they are preferably held in individual punch plates. This condition is found in large piercing dies

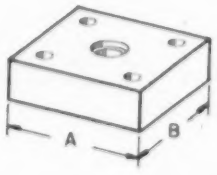


8 . . WHEN THE PART to be pierced has two levels, double punch plates avoid long piercing punches. Socket capscrews fasten lower to upper plate. The latter is held to the punch holder from the back. Note the double dowels—better than long dowels



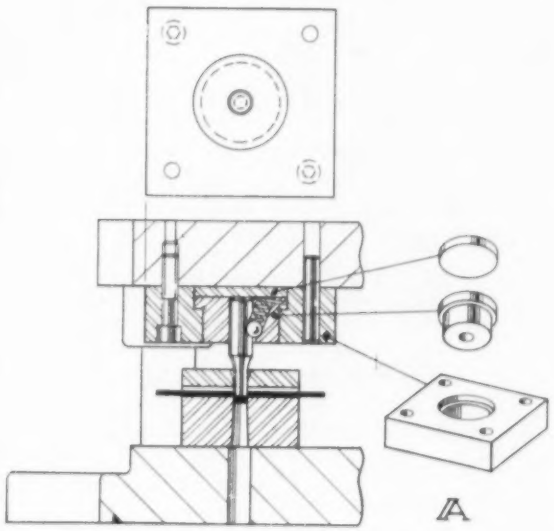
A	B
0 to 5/16	1/2
5/16 to 7/16	5/8
7/16 to 1/2	3/4
1/2 to 5/8	7/8
5/8 to 11/16	1
11/16 to 3/4	1 1/8
3/4 to 9/8	1 1/4
7/8 to 15/16	1 3/8
15/16 to 1	1 1/2

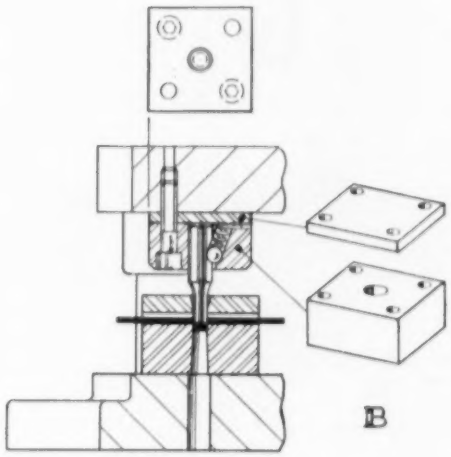
9 . . PUNCH PLATE thickness B should be approximately 1½ times diameter A of the piercing punch. With the table, the die designer can establish punch-plate thickness quickly

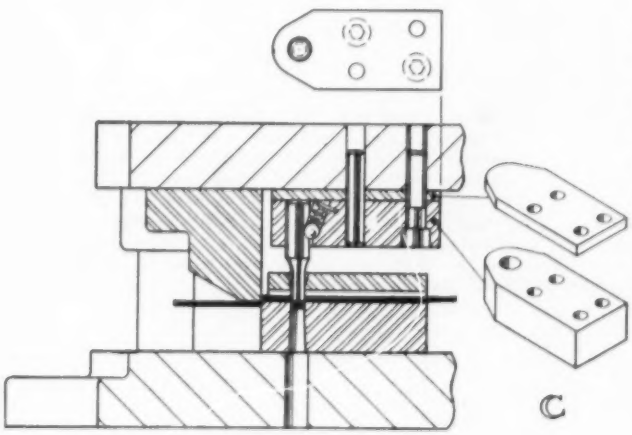


A	B
2	2
2	3
3	3
3	4
3	5
4	4
4	5
4	6
5	5
5	6
5	7
6	6
6	7
6	8
6	10
7	7
7	9
7	11

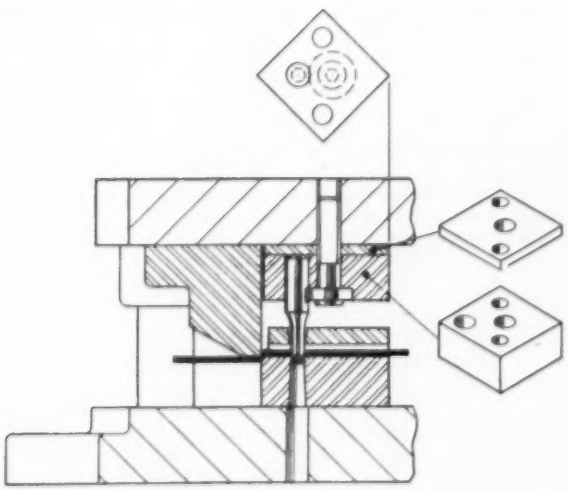
10 . . WHERE LARGE QUANTITIES of dies are produced, time and money can be saved by standardizing punch-plate sizes, and assigning part numbers. Most common sizes are tabulated





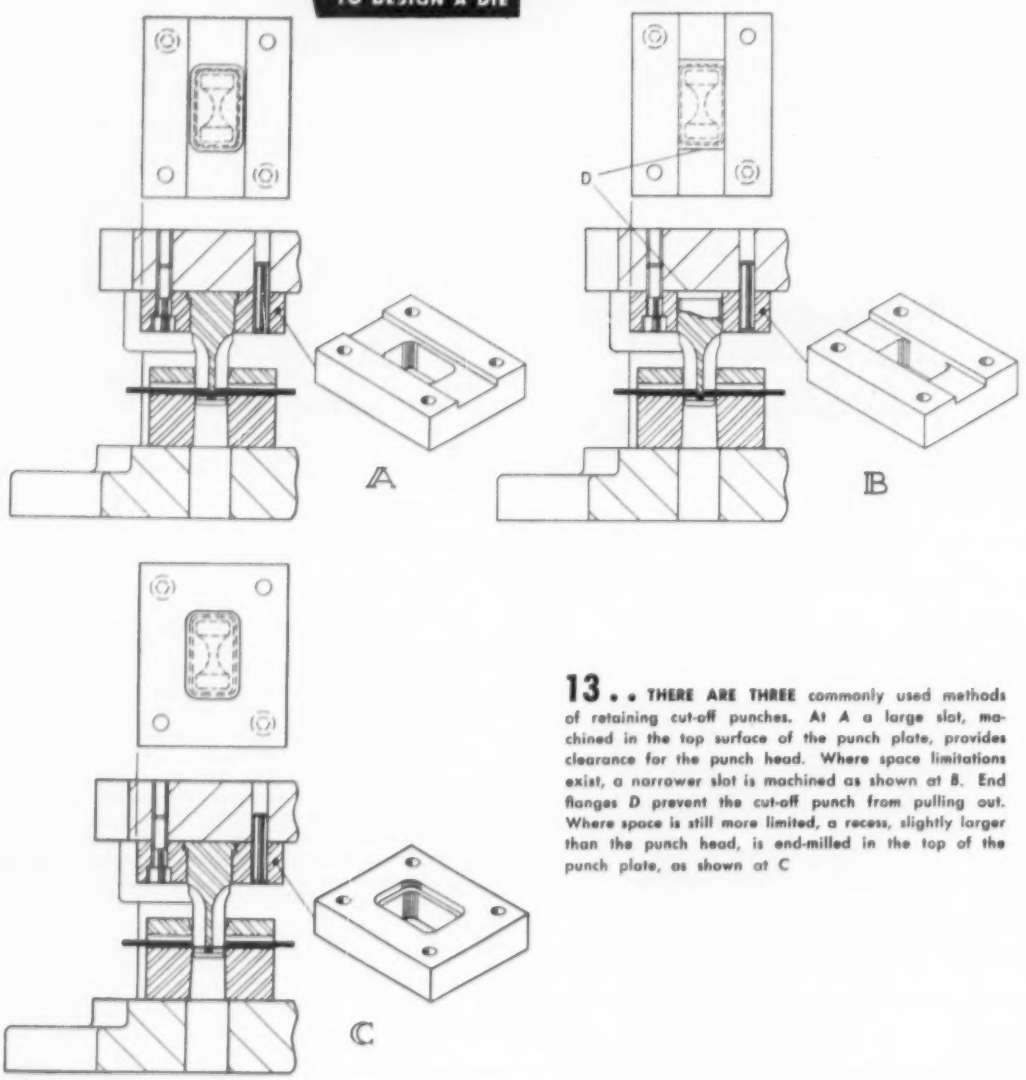


11 . . AVAILABLE from Allied Products Corp, Richard Bros punch plates can be purchased as standard components to hold the company's line of piercing punches. Three styles are supplied. At A is shown the round punch plate. It is machined to accommodate a hardened, spring-backed ball which engages a recess machined in the piercing punch. A hardened backing plate, made the same diameter as the punch plate flange, prevents the punch from sinking into the soft material of the punch holder of the dieset. B illustrates the more commonly used square punch plate, backed up by a hardened plate of the same size, while at C is shown the end-retaining punch plate, used where space is limited

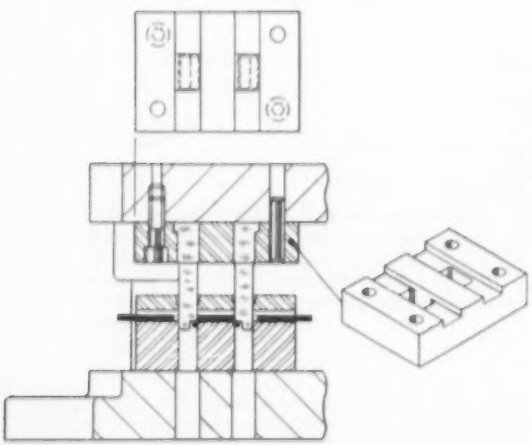


12 . . AVAILABLE from Hovis Screwlock Co, Hovis standardized punch plates are used to hold its line of standard piercing punches. These are retained by special quarter-turn screws that provide quick removal of piercing punches for replacement

How to design punch plates



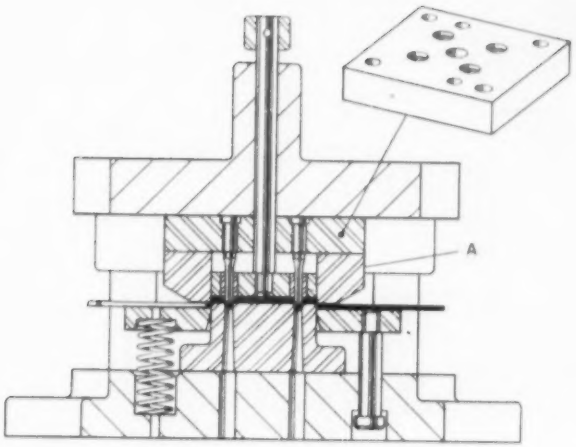
13 . . **THERE ARE THREE** commonly used methods of retaining cut-off punches. At *A* a large slot, machined in the top surface of the punch plate, provides clearance for the punch head. Where space limitations exist, a narrower slot is machined as shown at *B*. End flanges *D* prevent the cut-off punch from pulling out. Where space is still more limited, a recess, slightly larger than the punch head, is end-milled in the top of the punch plate, as shown at *C*

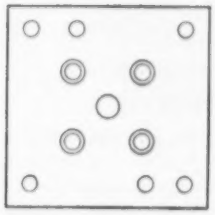


14 . . **NOTCHING PUNCHES** are generally held in their punch plate by means of slots machined in the top surface of the plate. Three sides of the punch head bear against the bottom of the machined slot to prevent the punch from pulling out

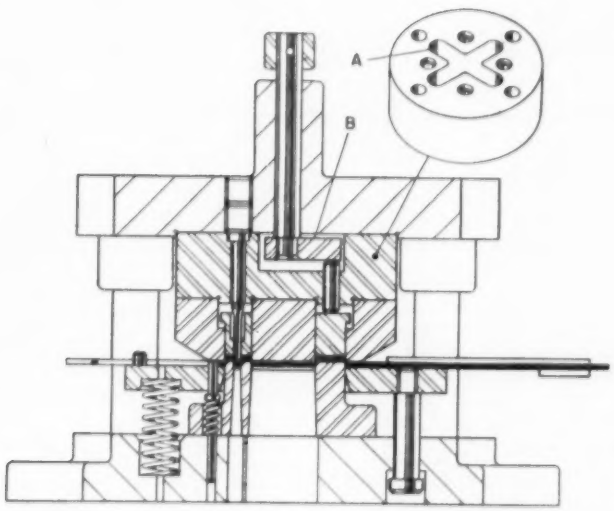
14 steps TO DESIGN A DIE

How to design punch plates

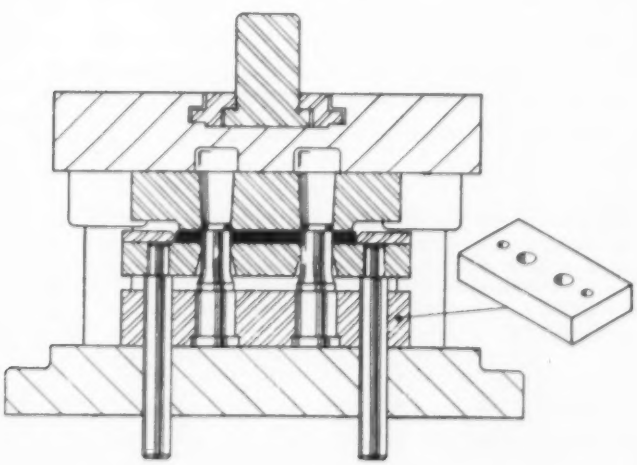




15 . . H PLATES used in compound dies are usually made large to provide a spacer under inverted dieblock A. Long socket capscrews, applied from the top of the dieset, pass through clearance holes in the punch plate and are threaded into the die block



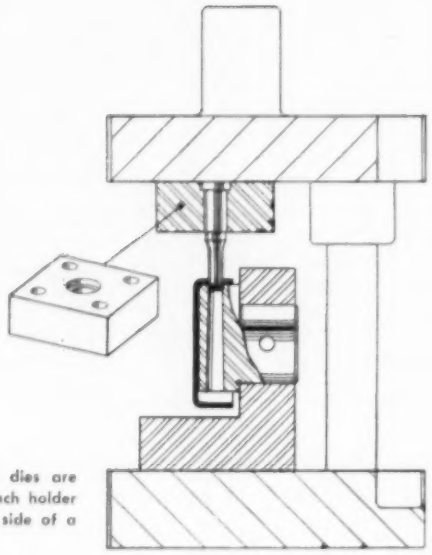
16 . . WHEN INDIRECT KNOCKOUTS ARE USED, the punch plate is recessed, as at *A*, to accommodate the knockout plate *B*. In this case the recess is shaped in the form of the letter *X*



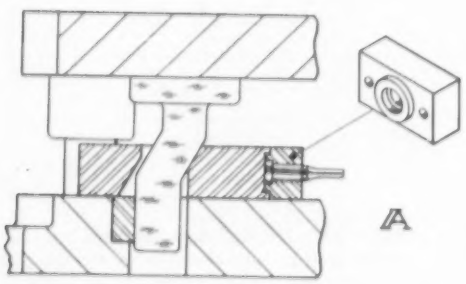
17 . . IN INVERTED PIERCING or shaving dies, the punch plate is fastened to the die holder of the dieset instead of being placed in its usual position under the upper punch holder. The illustrated die shaves two holes. The punches have been inverted to make use of the pressure attachment of the press for more effective stripping

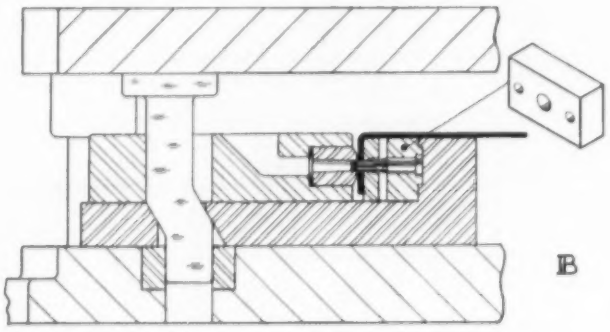
Next step...

When Mr Paquin continues the series on "14 Steps to Design a Die" in an early number, he will take up numerous methods for designing and applying pilots. These are especially important in multi-station dies. In fact, faulty design of pilots can be responsible for many press-line troubles.

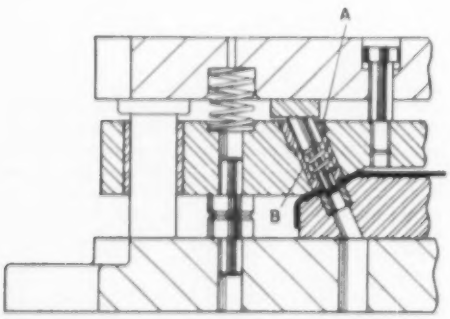


18 . . PIERCING PUNCHES used in horn dies are retained in a punch plate fastened to the punch holder of the dieset. This die pierces a hole in the side of a drawn cup





19 . . PUNCH PLATES for side-cam dies usually have a turned boss that engages a counterbored hole in the slide for accurate punch location. With this construction no dowels are required. The die shown at *A* pierces holes in the sides of shells when the burr is required to be inside the shell. The die shown at *B* pierces in the sides of shells when the burr is required to come outside the shell. Punch-plate construction is similar to *A*



20 . . FOR PIERCING ANGULAR HOLES IN SHELLS, the punch plate is made large, and guided on the dieset guide posts. It retains the spring-backed piercing punch *A*, which is guided in a hardened bushing *B* pressed into the punch plate. Hardened buttons limit downward punch plate travel

American
Machinist

SPECIAL REPORT NUMBER 419

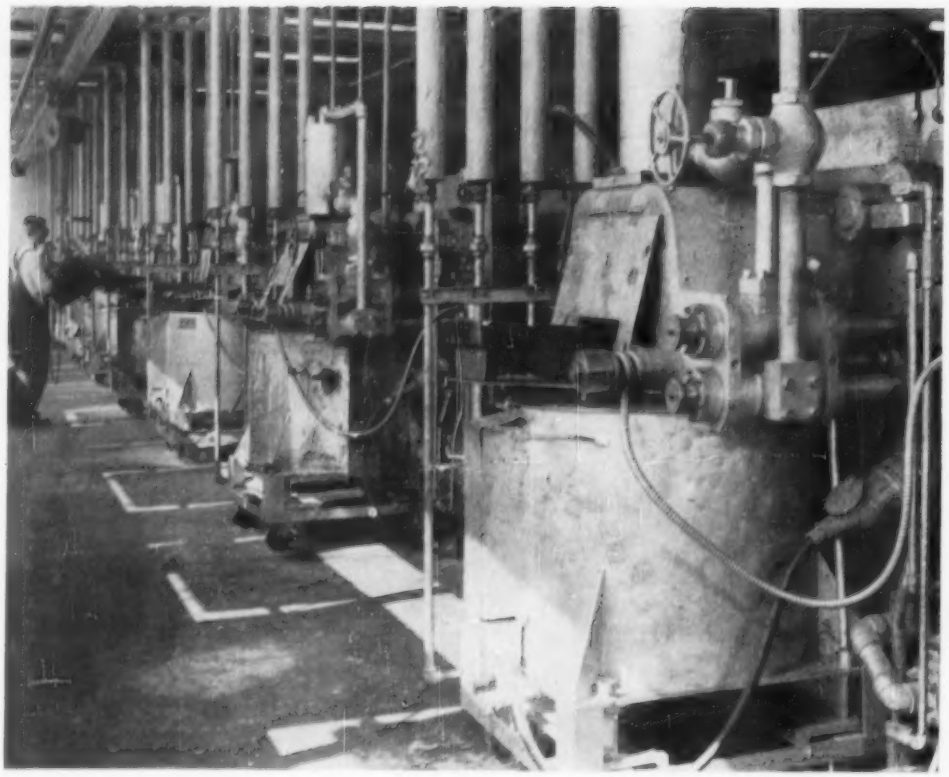
TOOLING BEHIND the TELEPHONE

GEORGE H DeGROAT, associate editor

Tools, materials, and methods to produce almost six million telephones a year include almost everything used in Metalworking. Stamping, machining, testing, plating, assembling, die casting, and molding are only a few of the processes employed at the Indianapolis Works of Western Electric Co, Inc, to mass-produce 18 different types of telephone sets. Emphasis is placed on high-quality and high-volume production—quality control being tied in with all operations. Multiple tooling, automatic setups, several miles of various types of conveyors, and even radio-dispatched materials-handling trucks are necessary parts of the operation.

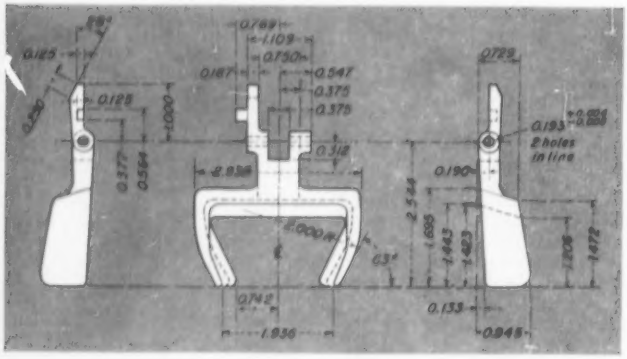
Resulting from the first editorial tour through the plant, this Special Report highlights some of the operations likely to be of broad interest to readers of AMERICAN MACHINIST. From the hundreds of parts that make up any one of the various types of telephones, we selected those that employed the most interesting setups in their manufacture. Here are tool designs applied in sheet-metal stamping, plastics compression and injection molding, die casting, and machining, as well as numerous automatic and semi-automatic assembling and processing operations.

COPYRIGHT 1956 BY McGRAW-HILL PUBLISHING CO, INC, 330 W 42 STREET, N Y 36, N Y



Die-casting tolerances . . .

are held much closer than those maintained in general practice. Dimensions across parting lines, for example, are held to ± 0.005 in., compared with ±0.014 considered standard in die casting. Linear dimensions are maintained within ± 0.0015 in., compared with the standard ± 0.003. To maintain an economical high-production level, ten die-casting machines and three furnaces run on a three-shift basis. To facilitate scrap handling, a mechanized floor-type vibratory conveyor carries scrap trimmed at ten punch presses to the furnaces for melting and then back to the machines for recasting



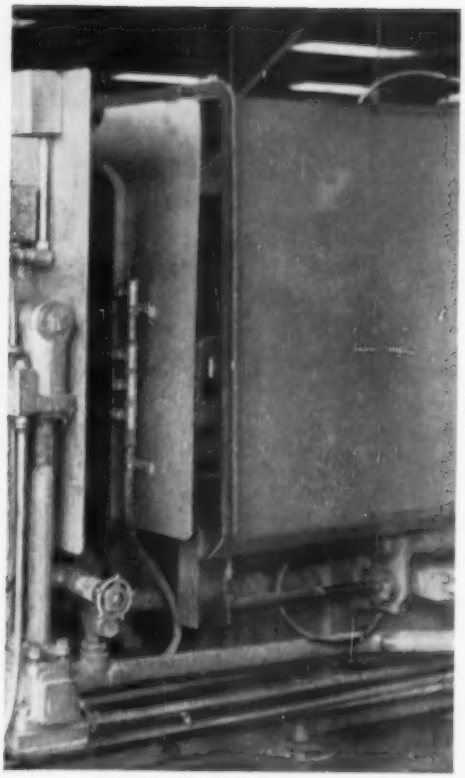
Switch hooks take a beating . . .

when someone slams a receiver down—therefore, high impact strength is essential. Parts weigh about ¼ lb each—are made up of zinc-aluminum alloy with a trace of magnesium. Different types of switch hooks receive different finishes—this one is chrome plated and polished, others are painted and some get a matte-finish chrome plate. All require considerable care in casting to eliminate flow lines, cold shuts and other surface defects that affect appearance

Secondary finishing . . .

operations are minimized by careful casting. Sprues such as those at left are trimmed in punch presses where flash is removed and they are checked for deformation. Burring and scraping sharp edges precedes polishing, degreasing, tumbling, blasting, and finally plating

STRENGTH, APPEARANCE AND PRECISION IN DIE CASTING...

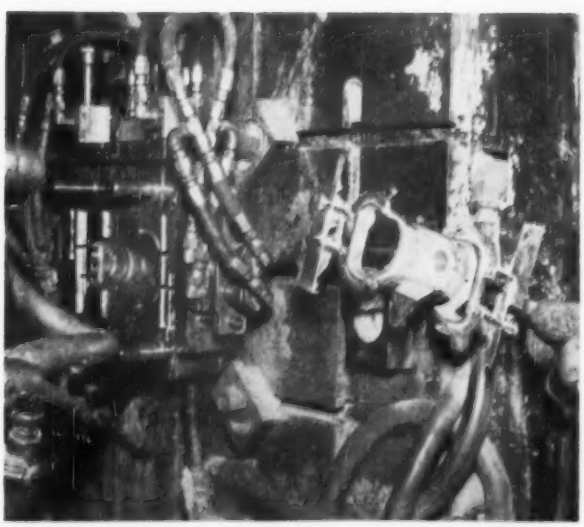


About 40 different parts of a typical telephone set are die castings—amounting to an annual production of over 40 million pieces. Telephone sets are built to stand abuse because they are occasionally dropped or handled roughly. With telephones made to last 20 years, die-cast components must be strong as well as attractive.

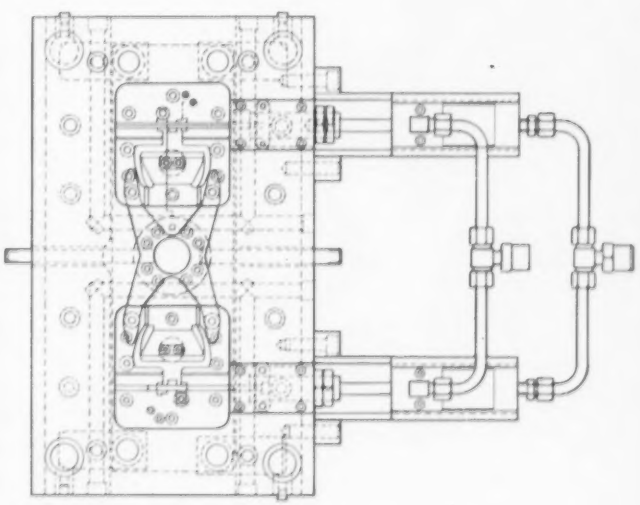
Good castings are essential, not only for strength, but for economical processing where subsequent buffing and polishing operations can be minimized for such finishing as plating and painting. Moreover, a high degree of malleability is needed for machining, swaging and staking. In some parts, internal threads must be strong enough to resist stripping when the part functions as a nut.

To achieve a balance between strength and appearance, close control is maintained over melts, pouring temperature, die temperature, die lubricants and material analyses. Zinc alloys are based on standard commercial materials but are carefully mixed in the plant. Free-flowing alloys that normally produce good appearance and a smooth cast finish are not being used because their high copper content produces castings somewhat below minimum strength requirements. For the same reason, lead contamination must be avoided.

Precision is also important, and to gain a high degree of accuracy—somewhat better than conventional die-casting accuracies—precision dies are built and high clamping pressures are used to keep parting lines at a minimum. Of course, close control is exercised over the whole process. Analyses, for example, are made for each melt—that is, once for every 3500 lb of material.

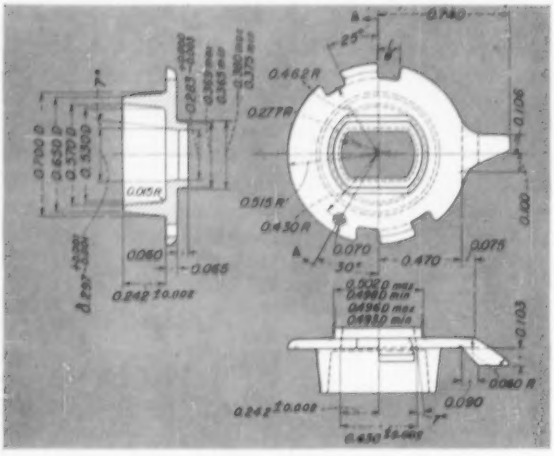


Individual hydraulic core pulls . . .
are employed with two-cavity switch-hook die. Two cylinders, with 1-in. bores and 2-in. stroke, are attached to the stationary side of the die and are operated by the hydraulic circuit in the machine. Core pulls, such as this, cut setup time—eliminate machine core pulls often not used to full capacity. Individual core pulls suit requirements of particular parts and stay with the die for which they are made



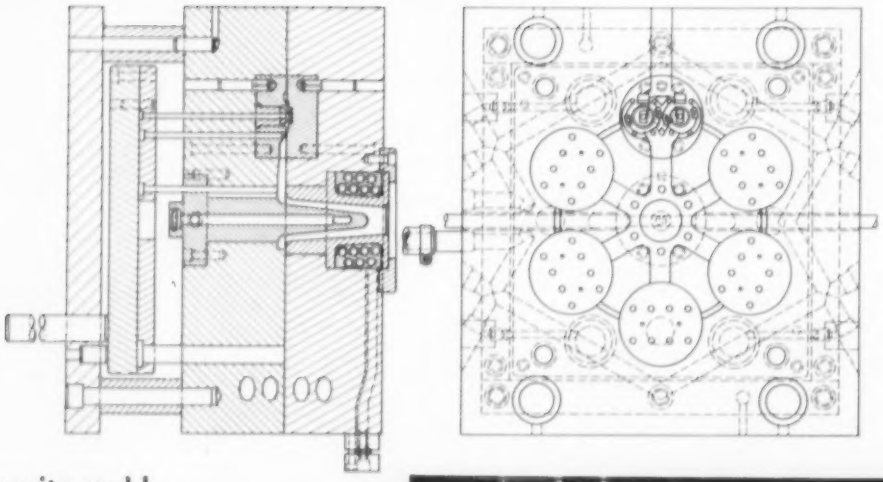
400 switch hooks per hour . . .
are made in this two-cavity die to produce an annual requirement of 1 million parts. Chrome-nickel-moly blocks and yokes combined with wear-resistant inserts provide long life while holding accuracy of dimensions. All dies are inserted rather than solid for easy maintenance and replacement of worn areas. Die strength is needed, too, to withstand up to 400-ton clamping pressure used to keep parting lines small

MULTIPLE-CAVITY AND 'FAMILY' DIES . . .



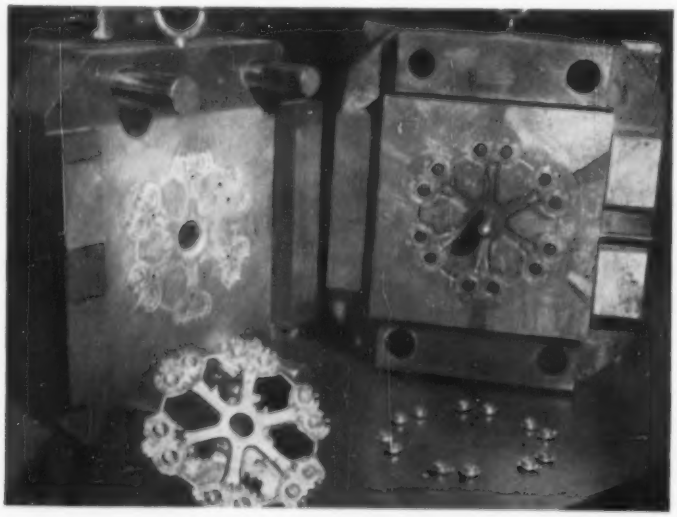
About 8 million per year . . .

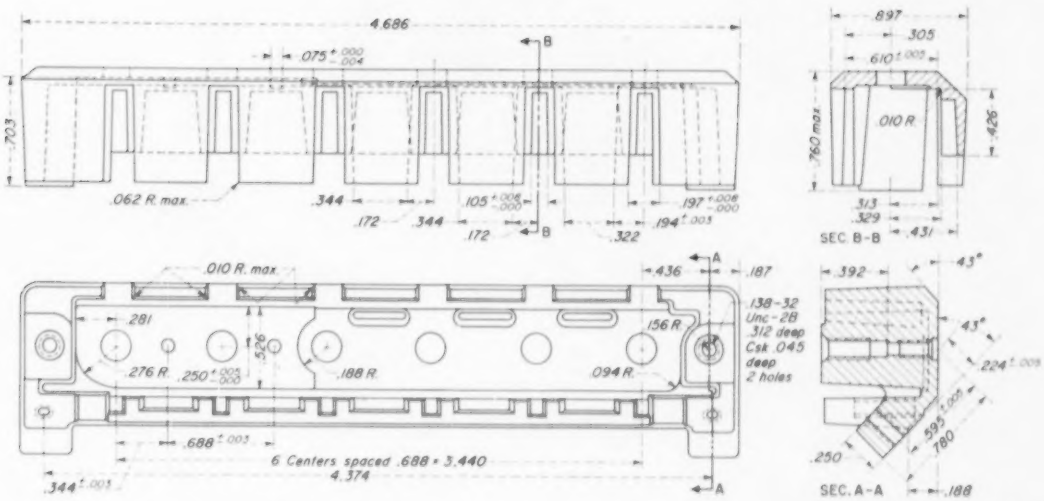
is the production volume of dial-mounting hubs. Material runs about 19.5 lb of zinc per thousand pieces, 0.8 lb aluminum and 0.008 lb magnesium, including 10% allowance for loss in alloying and casting. In casting, observation is made for abnormal flash after approximately every eight shots, and circulating-water valves are adjusted for optimum surface finish. Special checks of rectangular hub and tapered bore are not needed because tools are constructed to produce parts within limits shown. Two sets of parts attached to the sprue are inspected to observe and control die condition during each shift. After casting, parts are trimmed from gates, flash is removed, and an 0.070-in.-dia hole is pierced



12-cavity mold . . .

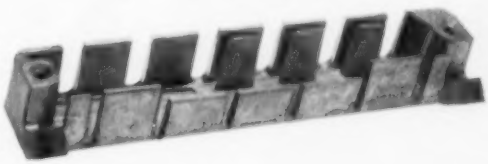
with six clusters of two cavities each produces 2400 dial-mounting hubs per hour. Number of cavities built into dies is determined largely on basis of economics, that is, cost of die versus cost of running parts of a given production volume. Cost of $18,000 to build this die is warranted by high volume production





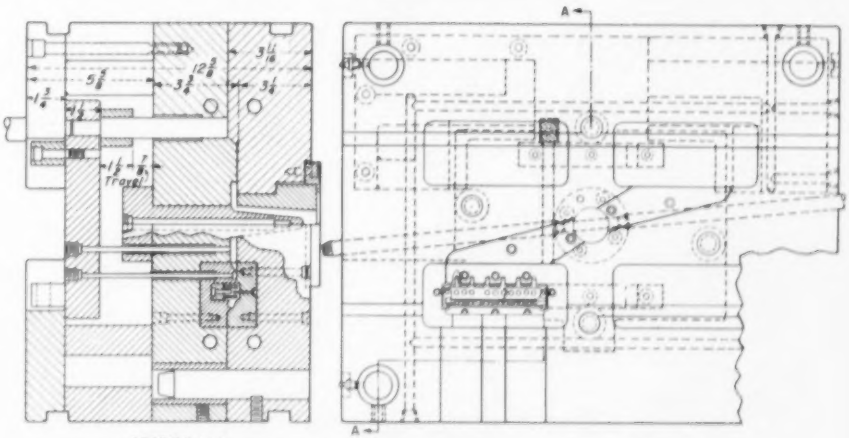
High strength and good appearance . . .

are essential in die-cast multiple-button key frames. After casting, parts are carefully broken from the gate and remaining flash is removed by means of a polishing lathe. Trimming follows, with air-blast ejection adjusted to prevent deformation of legs. Frames are drilled and tapped, finally degreased and inspected for cleanliness and appearance before assembly. Yearly volume runs about 600,000 pieces—cast at approximately 418 per hour

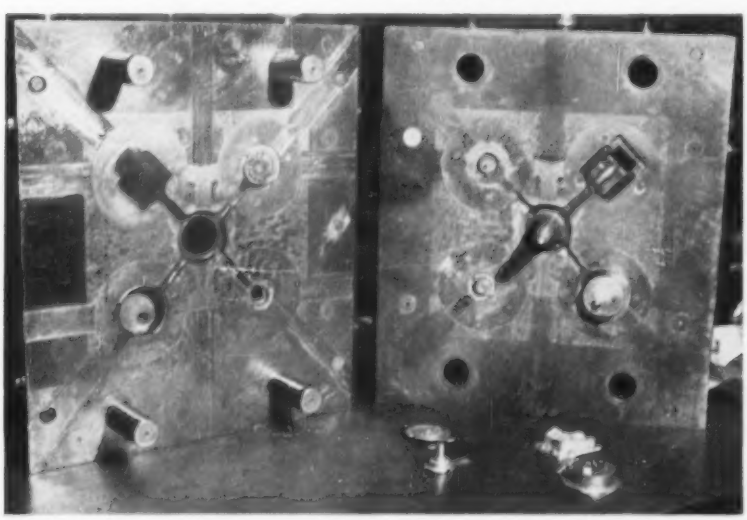


Close tolerances, super finishes...

go into die-casting dies like this two-cavity set for key frames. Thin sections in this part necessitate special casting practice to insure soundness throughout. Before the first shot is made, this die is preheated to 210F, care being taken not to use open flame on the cavities. Ejector pins, cavities, and core pins are brushed with oil after every five shots, and die faces are wire brushed when excessive flash builds up or sticks to them

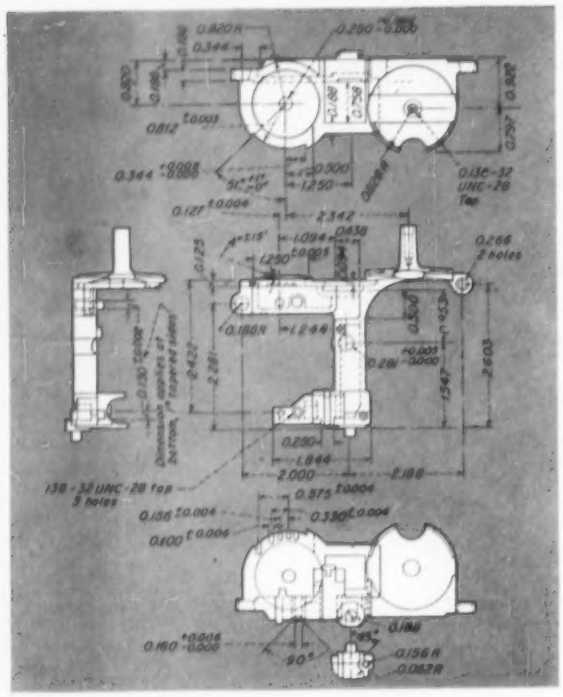


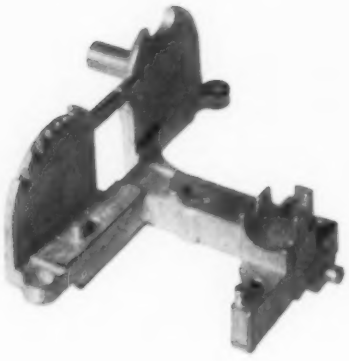
SECTION A-A



"Family" die cuts tooling cost . . .

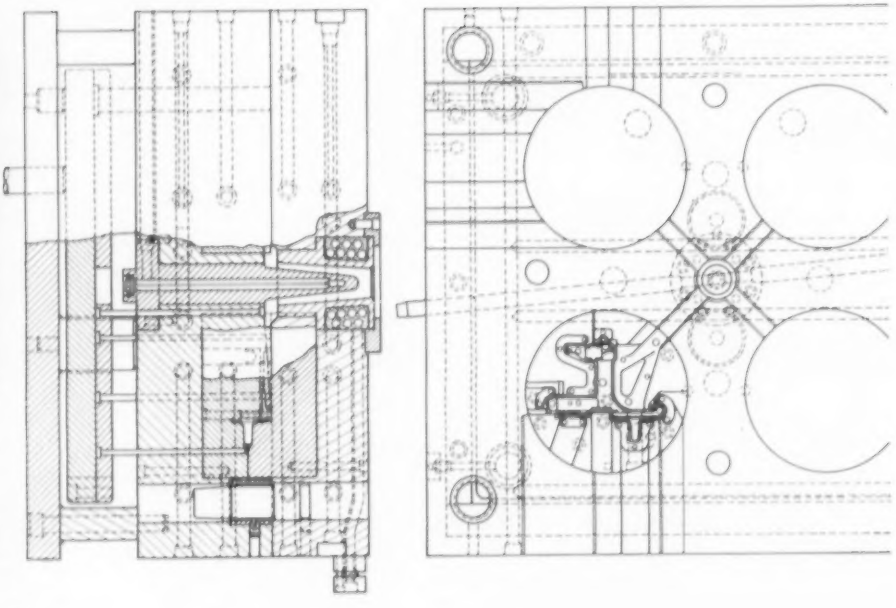
is capable of producing a number of different parts. Consisting of a common yoke and die block, this tool is used with different interchangeable cavities. Parts made in relatively small production quantities are made in "family" dies, while high-volume, long-run jobs have individual dies. These dies are also useful for evaluating parts experimentally for possible die-casting applications





Strength is important . . .

to ringer frames, which carry all parts of ringer in assembly. Production requirements run about 7 million frames per year. In casting, two gates of parts are submitted to Inspection twice each shift—frames are carefully checked for cold-flow marks and other die-casting imperfections as well as soundness. Subsequent machining operations, after trimming, polishing, and tumbling, include drilling, milling and reaming



High-level production . . .

of ringer frames is accomplished in this four-cavity die at a rate of about 617 per hour. This die, like the others, is run in a 20-oz machine equipped with interlocking safety cylinders. Casting pressure is about 1000 psi with a clamping force of 400 tons. Constant trouble-free operations of dies is assured by a tool-maintenance program based on scheduled check for wear at critical points. Tied in with production scheduling, this system permits die repair and maintenance without downtime or loss of production

Compression-molded terminal plates . . . are needed in quantities around 7½ million per year. Each part receives two metal inserts—is made with one 8- to 9-gm preform. After molding, tumbling, air blasting, and grinding to remove flash from the periphery, numerous holes are drilled and tapped, followed by deburring and removal of molding flash from insert surfaces. Detailed inspection is the last step for defects such as chipped cones, holes through the coil-stop recess, broken bosses, cracked grids and cracked or broken rims

TRICKY TOOLING PRODUCES PLASTIC PARTS . . .

Injection and compression molding are widely used in the production of such telephone-set components as housings, receivers, handles (or hand sets), protectors, transmitter and receiver caps, and many others. Vast quantities of plastics are used. Black phenolic molding compound, for compression molding, is stored in 26 tanks of 26,000-lb capacity each, while black cellulose-acetate butyrate for injection molding is stored in 18 tanks that hold 22,000 lb each.

Molding compounds are drawn from suppliers' trucks into a central switching unit by suction and from there pneumatically carried to the tanks. Phenolic compound is conveyed from these tanks to a process storage tank over the preform room, and from there is automatically loaded into hoppers at the tabletting presses. Preforms are used extensively in compression molding to speed curing cycles, increase speed and accuracy of loading, and to facilitate molding of intricate parts. Oblongs, rings, circular disks and rectangular preforms ranging in weight from 1/3 to 4½ oz are used to make telephone parts. New 200-ton presses are operated at 30 strokes per minute to produce approximately 3000 preforms per hour, over 25 million per year.

Injection-molding material is handled in much the same manner as that employed for the phenolic. A rotary-drum dryer receives the material from a process storage unit and from the dryer it is carried to the hopper of injection-molding machines by means of an overhead screw-conveyor system.

Colored injection-molding material, for use in the production of the relatively new colored telephones, is of necessity received and handled in conventional drums to prevent mixing—however, cleanliness and good housekeeping are basic requirements in avoiding color contamination.

Eight new vertical presses have been installed especially for producing colored handset handles and caps. The vertical machines permit the handling of loose die details (for coring and forming screw-threads), on the horizontal platens without special provision for locking them in place. This permits higher production rates and simpler operation.

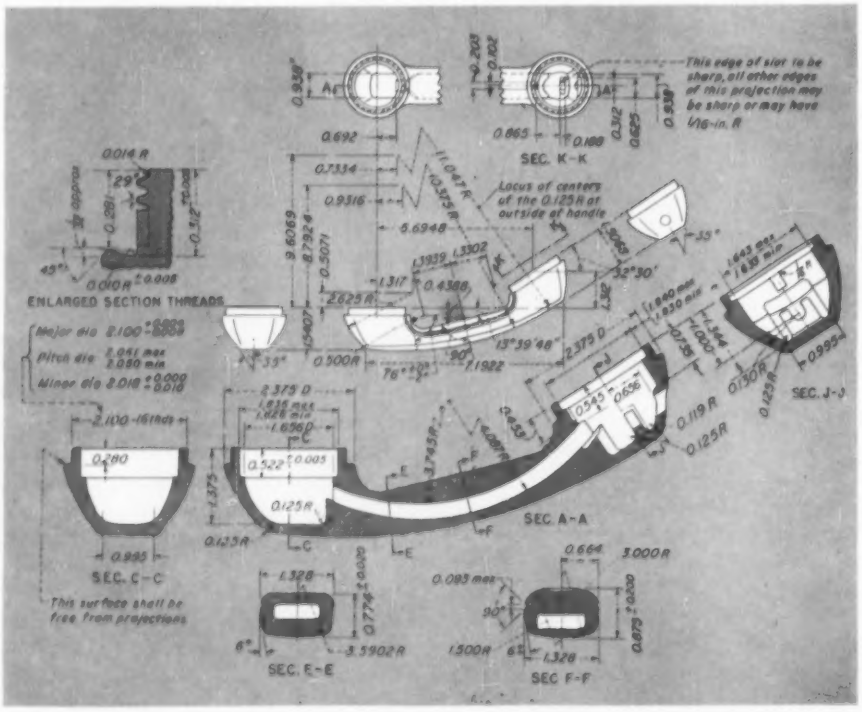
Plastic-molding operations, like die casting and other processes, are set up for high production. Handsets, for example, are required in quantities of 3 million per year for the compression-molded type and about the same volume for those that are injection molded. Housings are made on a basis of 5½ million per year, and terminal plates are required in quantities of 7½ million per year. In addition to the mechanized materials-handling system, overhead conveyors run through the molding rooms to carry finished parts. Multiple-cavity tools and special loading and unloading fixtures speed production.

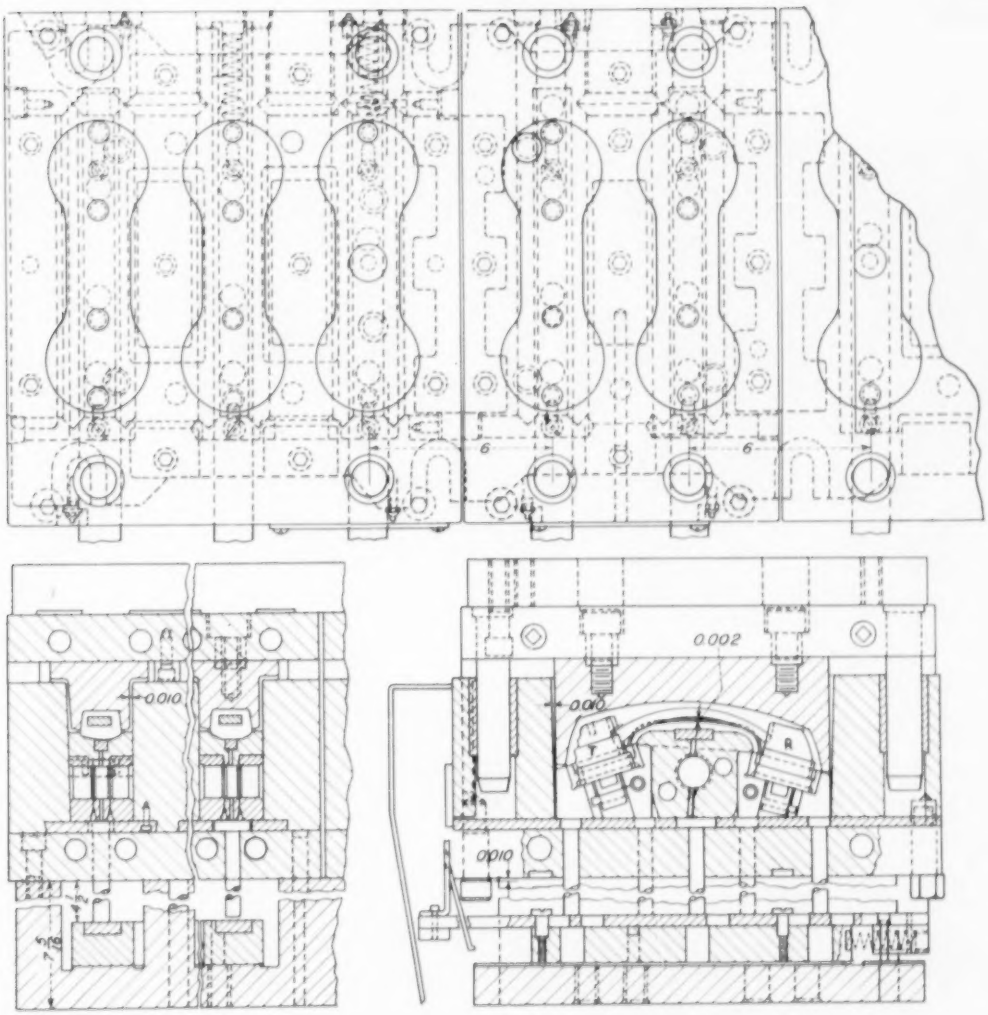
Carefully weighed preforms . . .

are preheated to 230 F in hf electronic heaters adjacent to handle-molding presses. Two are loaded into each of the eight lower die sections well within 30 sec after reaching this temperature. Because of such variables as molding materials, volumes of die cavities, and die escapement areas it is essential that exact weight specifications be maintained in preforms. Close control is exercised by constant checks, and special procedures are employed every time a new batch or make of material is used. Used to speed the curing cycle and to increase speed and accuracy of die loading, these preforms weigh 100 grams each, are $2\frac{3}{4}$ in. in dia by 1 in.

Special coring and threaded die details . . .

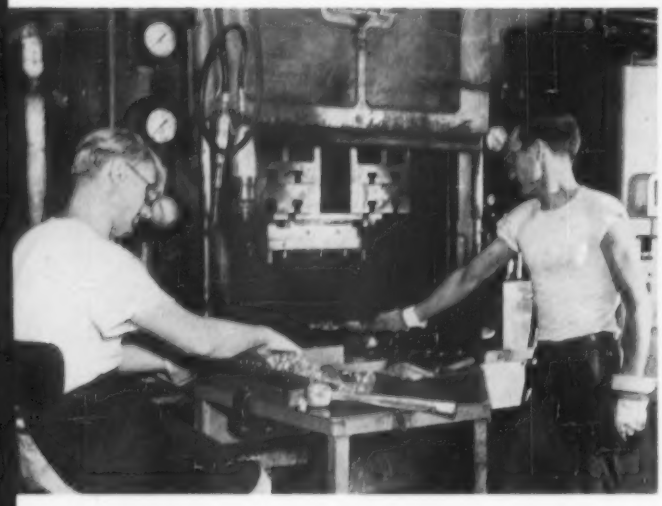
complicate molding handset handles but are essential to produce an interconnecting channel between transmitter and receiver bowls as well as to produce external threads on these members. Helper assembles the details on eight lower dies in transport trays while press operator molds eight handles. At ejection, the operator places the lower dies with molded parts on a transfer tray into the swing table and receives a new tray for reloading the press. The helper then unloads the molded parts using a specially developed rotating double-die extractor at the table for unscrewing threaded components. Production rate runs about 110 pieces per hour from one-eight-cavity die

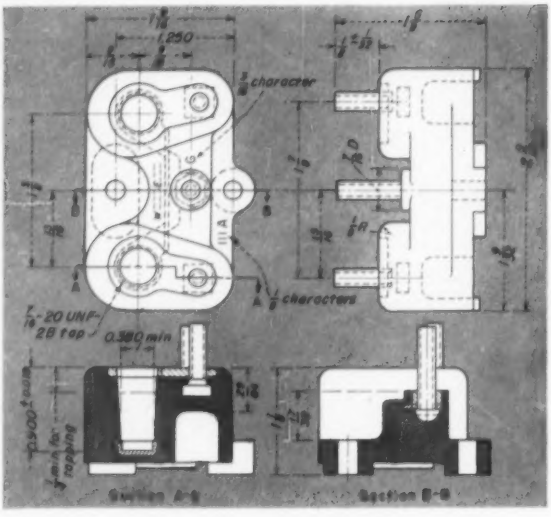

SEC. K-K
This edge of slot to be sharp, all other edges of this projection may be sharp or may have 1/16-in. R
Locus of centers of the 0.125 R at outside of handle
ENLARGED SECTION THREADS
SEC. J-J
SEC. A-A
SEC. C-C
This surface shall be free from projections
SEC. E-E
SEC F-F



Rugged construction . . . close tolerances and super finishes are essential in compression molding tools for phenolic resin handset handles. Punches and dies are chrome plated for wear resistance and high finish in addition to such advantages as easier removal of the part from the die and flash from the part. Clamping pressure of 330-ton tilting-head hydraulic press is 240 tons with closed press time of 2¼ min and dies at 340 F. Big-run production warrants cost in excess of $40,000 for one eight-cavity die. Tool dimensions allow for 0.006 in. per in. shrinkage of black, two-step wood flour and flock-filled phenol molding compound

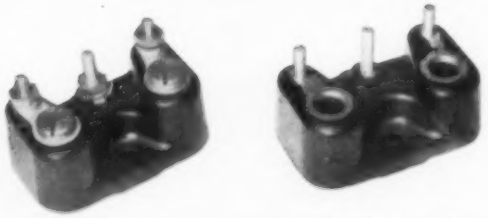
MOLDING METAL INSERTS . . .



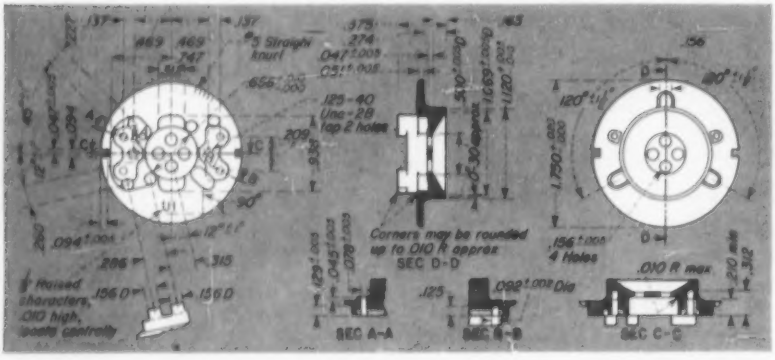


Transfer-molding . . .

phenolic resin protectors in which threaded inserts are required is handled quickly and efficiently with three separate units at each molding press. First unit is 5-kw electronic heater that brings preforms to about 210 F. Operator, meanwhile, seats cores for internal threads in a bottom half of the mold on the press table using a 300-ton hydraulic seating fixture. Mold section rides easily between the seating fixture and the die opening on balls in the press table. The mold half, rolled into the die opening, is automatically located by a fixture that actuates a limit switch for starting the press ram and a time when the die is positioned. Press ram closes, after the hot preform material is transferred to the molds, exerting 200-ton pressure for a 1½-



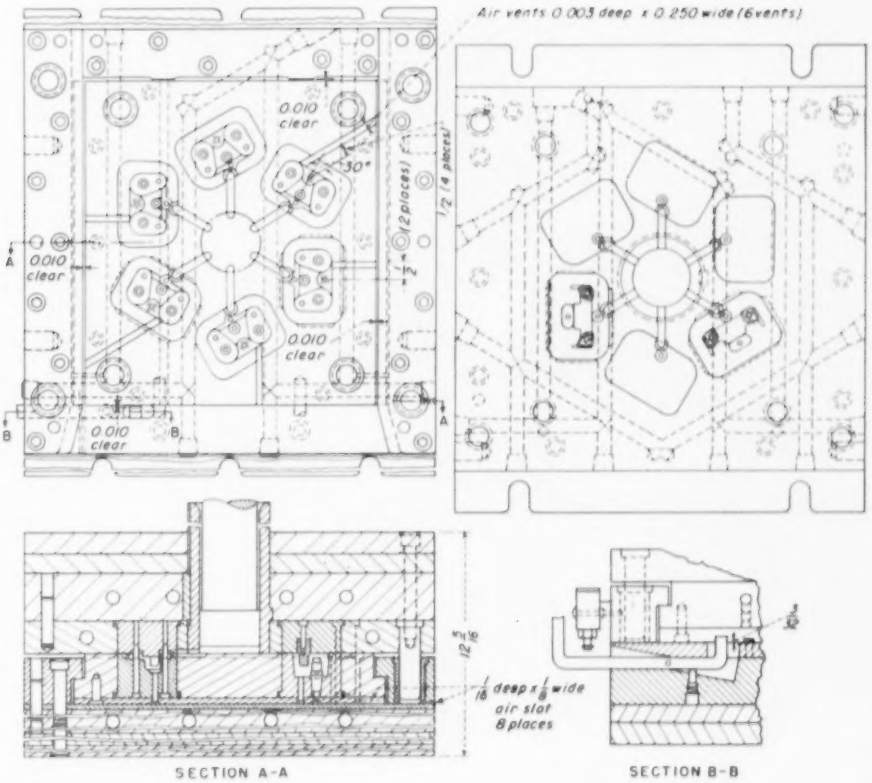
min. cycle with the die temperature at 350 F. After this, the timer opens the press for ejection. Third unit is the insert and core-loading station where a helper installs these units in a second bottom mold section with an air-operated impact tool



Toughest compression-molding . . .

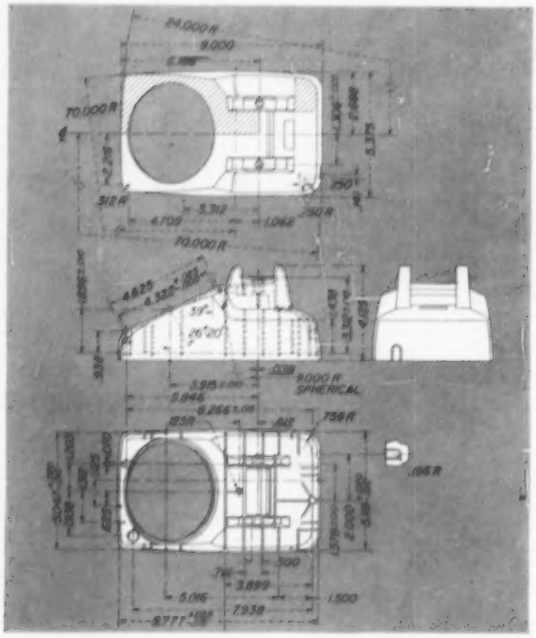
job is the black phenolic-resin handset handle. Because of large quantities required, six of these setups are run on a three-shift basis. Overhead conveyor runs the length of the line—carries molded handles to inspection and subsequent operations. One operator and one helper are needed at each setup—the operator runs the machine while the helper loads die details for coring and threading on special transport trays and also unloads trays with moldings. Special swing table speeds transfer of trays

Six-cavity transfer molding die . . .
produces about 120 protectors an hour. Lower section is movable to permit removal for loading and unloading cores and inserts. Two of these sections are working at all times in connection with one die. One is in the die during the molding cycle, another is being unloaded and loaded. Made of hot-work die steels, these tools are dimensioned to allow for 0.005 per in. shrinkage of phenolic-resin material



SPECIAL TOOLS AND NEW TECHNIQUES FOR INSPECTION MOLDING . . .

About 5½ million . . .
telephone-set housings per year are made of cellulose acetate butyrate in 14 horizontal machines ranging in capacity from 16 to 32 oz. Overhead conveyors pass between the machines to transfer molded parts to inspection and assembly. Butyrate, used for dimensional stability, appearance, and ease of molding is heated to approximately 400 F and is then injected into the mold at a pressure of 20,000 psi. After molding, parts are visually inspected, gaged for depth of inserts, bottoms are sanded at an adjacent table, and they are then loaded on the conveyor

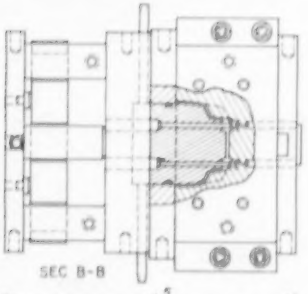


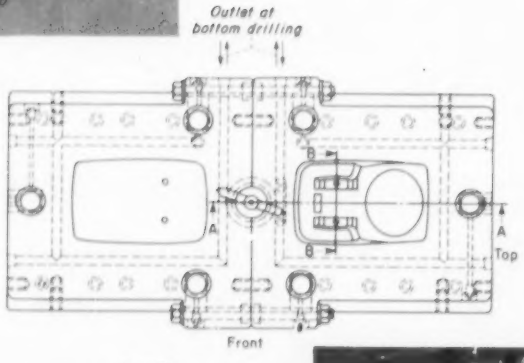
Intricate shape of housings . . .

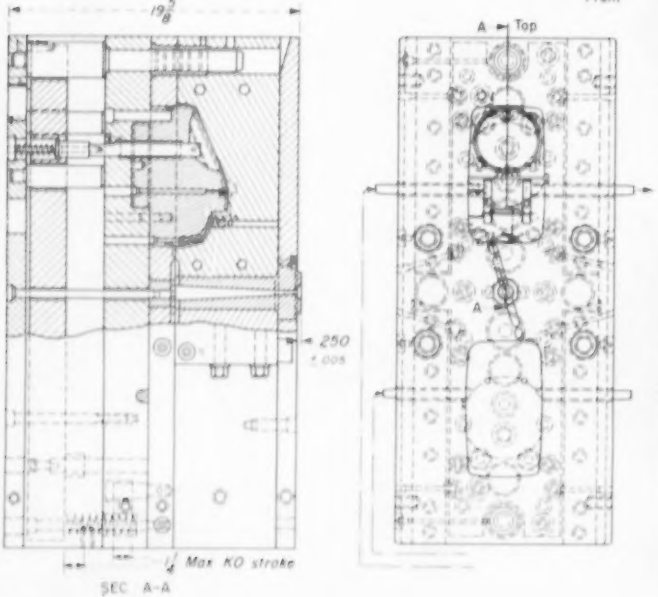
and especially good appearance necessitate care in molding. New colored housings must be free from traces of different colors. This is accomplished by starting each new run with a clean cylinder and running colors in a specified sequence. First ivory is run, then yellow, followed by beige, gray, green, blue, red, and finally brown. Scrap is segregated by color, ground up, dried, then mixed with virgin material for re-use. Hand grip openings and plunger holes are broached in housings, after which flash is trimmed from cord-hole openings and loose burrs are removed. Air blasting and final inspection finishes the process

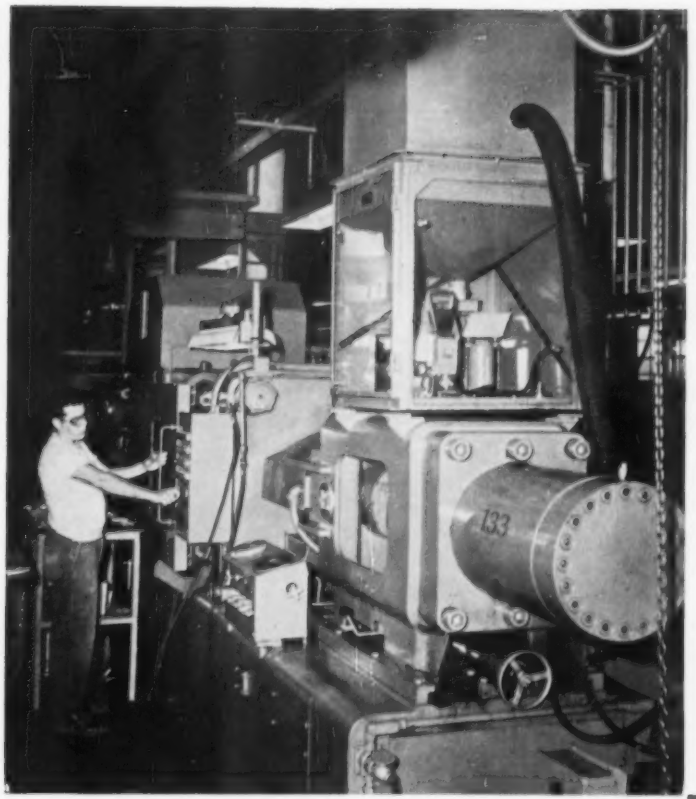
Two-cavity stripper-plate . . .

mold for housings produces 120 per hour and is loaded with two brass inserts before each shot. A special movable pad forms the large dial hole in the housing and is automatically actuated by a knockout bar to move out of engagement with the rest of the tooling when the part is ejected. Angular surfaces around the hole would tear at ejection if this pad were stationary because the knockout device is not at a right angle with the hole. Working surfaces are highly polished and tool dimensions allow for 0.006 in. per in. shrinkage



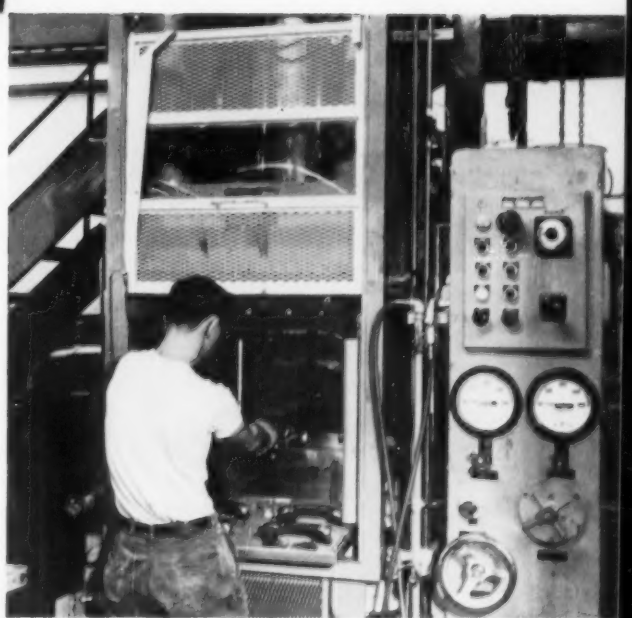






Weigh-feeding method . . .
is used to measure granules before being heated and formed into housings. Hopper-fed granules are emptied onto pre-adjusted scales (upper right). When balanced by the exact amount of granules, a limit switch cuts off the feed. The load is then transferred to the heating chamber. Weigh-feeding improves surface finish, decreases cycle time, and uses raw material more efficiently

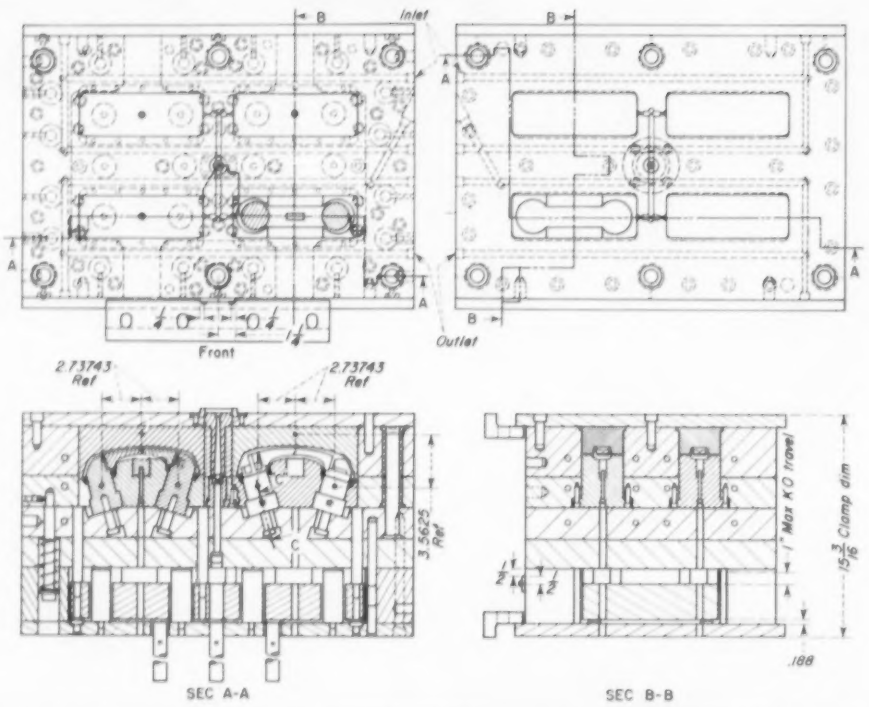
NEW MACHINES JUMP PRODUCTION . . . ▶

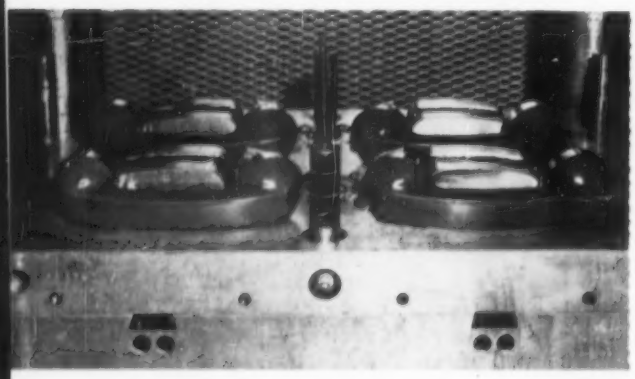


Product design simplifies tooling . . .
for making injection-molded colored-handset handles. Cores and rings for external threads at transmitter and receiver bowls number four separate pieces as compared with eight for compression-molded phenolic handles. About 2½ million colored handsets are made per year to meet current demand for colored telephones. After molding, parts are checked at the press for sink marks, surface contamination, open or excessive welds, moisture streaks, gates broken into the part, damaged receiver seating surface and discoloration. After inspection, bowls are chamfered, cord hole drilled. Polishing and buffing follow

Four-cavity injection molding die . . .

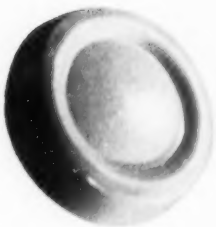
costs about $30,000 and produces colored handset handles at 120 to 140 pieces per hour at a closed press time of 65 sec. Although these tools are simpler than those employed for compression molding (and injection molding is easier to control), difference in material costs must be taken into account before changing over completely to injection molding. As a result, both methods are employed here to maintain an economic balance related to production needs. Care given the tools in this molding operation consists principally of lubricating cores and threaded rings with a silicone solution every fifth cycle

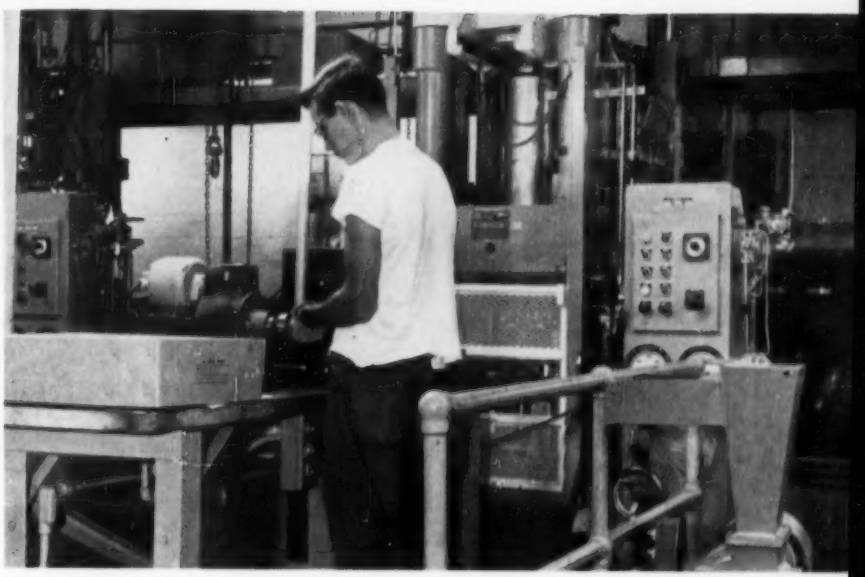




Special fixtures and work trays . . .

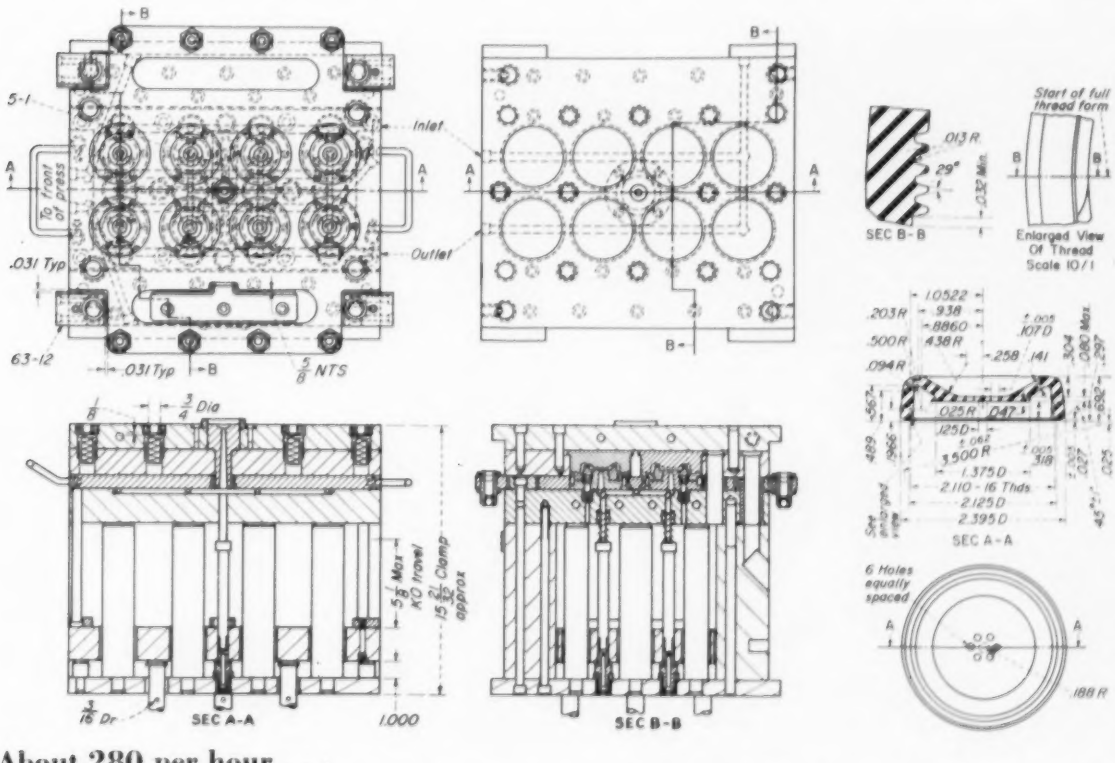
speed operation of four-cavity mold for making colored handles in a vertical press. When the press opens, the operator unloads the mold details (or thread rings and cores), together with the molded parts into a special felt-lined tray with recesses and studs that fit each detail. A second set of die details are then loaded into the mold from another tray from which the parts have previously been removed. The press cycle is started again and the operator then strips the molded handsets from the latest set of die details. After clipping the gates from the cluster and tapping the parts lightly to remove core details, unscrewing the threaded rings is accomplished by pressing the work against a spring-loaded spindle that rotates when a clutch is engaged. An adjacent granulator receives gates and sprues—feeds the material into a hopper where it is dried as it is being added to virgin material for reuse





Another vertical-press setup . . .

is one used for injection molding handset caps. Here, too, the operator loads and unloads the press, but in this case the trays are actually part of the mold. Rings that produce internal threads (matching external threads on bowls of handles), are loaded into a lower die section and moved into place. After the cycle is started, previously molded caps are unscrewed from a second set of die details which are again loaded into a tray or die section ready to be replaced in the press



About 280 per hour . . .

is the production rate for handset caps in this eight-cavity mold. Receiver cap is shown, similar transmitter caps employ like tools. Parts require 60 lb of cellulose acetate butyrate per thousand pieces—are visually checked for surface defects, weld lines, moisture streaks, flash and color at the press. After trimming the gate and flash from the 2.145-in.-dia opening, holes are pierced—six for receiver caps, 18 for transmitters. Grinding, polishing, and inspection complete the operation. Tools are operated at 280-ton clamping pressure for 60 sec. Injection pressure is 1800 psi for 25 sec and material held at 380 to 400 F

STAMPING SETUPS ARE NUMEROUS AND VARIED...

Press-room operations are set up to handle over 3000 different stampings that go into telephone sets —an annual production volume of over 1½ billion pieces. Thousands of tons of various types of steel and other metals are used up in presses ranging in capacity from one to 150 tons.

Some setups are completely automatic, others are semi-automatic and, of course, many are manual. In many cases, multiple-press arrangements are employed, with conveyors running from one to another to permit progressive processing of parts. A great many multi-station progressive dies are used, too, as well as numerous compound dies.

Typical of uptodate developments is an automatic oil-mist lubrication system employed on some punch presses. Designed to reduce oil drippage from bearings, the system has no moving parts and provides constant lubrication with a small amount of oil. Compressed air atomizes the oil into a vapor, after which it is carried to the bearings at low air pressure. In passing through a special fitting at the bearing, the oil condenses, thus provides lubrication. Installation cost was paid for in about eight weeks by savings in tool repair.

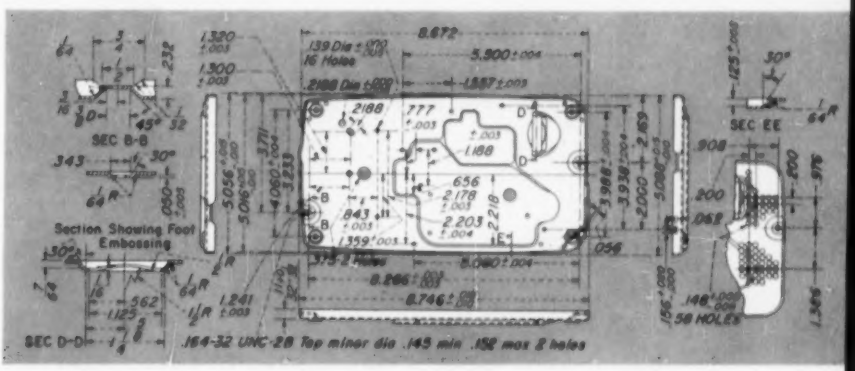
SAFETY IS IMPORTANT, TOO

As in the rest of the plant, where gloves, aprons, caps, glasses, shoes and other safety devices are worn as needed, a safety program is carried out in the press room. To insure a high degree of safety in press operation, a regular program of inspection has been initiated. Red tags marked "Unsafe to Operate" are attached to machines on which minor repairs are to be made. Tags effectively prevent operation until they are removed—after corrective repairs are made. They are never used casually—are only placed on a press when they are urgently needed to protect an operator from possible injury. Following pages illustrate some of the high-volume production stamping setups employed in this plant for making telephone components.

One job at a time . . .
is the order to operator at this setup where telephone base plates are made in a progressive die. The press is not run while the operator is doing other work—a helper is required to supply press with empty work pans, remove scrap, aid in loading coils and to check one part in every hundred with location, plug, tap, snap and height gages. Press has 150-ton capacity —is run at 45 strokes per min, and is fed with an automatic roll feed through a straightener

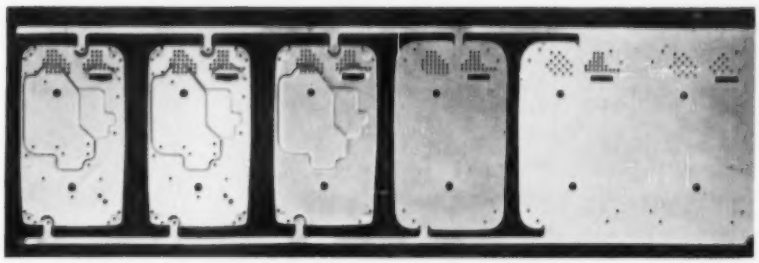
DIES ARE COMBINED...

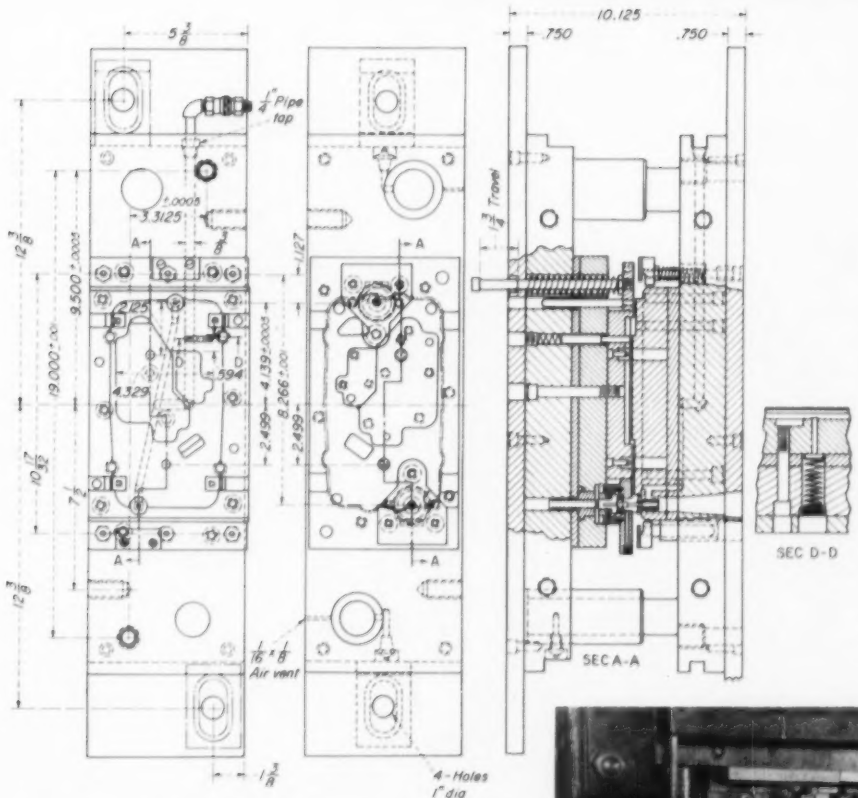
have tapping heads and scrap conveyors



Angular emboss eliminates twist . . .

previously encountered in stamping base plates. Stock is 0.042-in.-thick CRS, 10½ in. wide, No. 5 temper. Production requirements run about 4 million pieces per year made at a rate of 2000 per hour. After stamping, plates are inspected, degreased, grit blasted, bonderized, rinsed and dried—then dip painted with black lacquer and given a final inspection



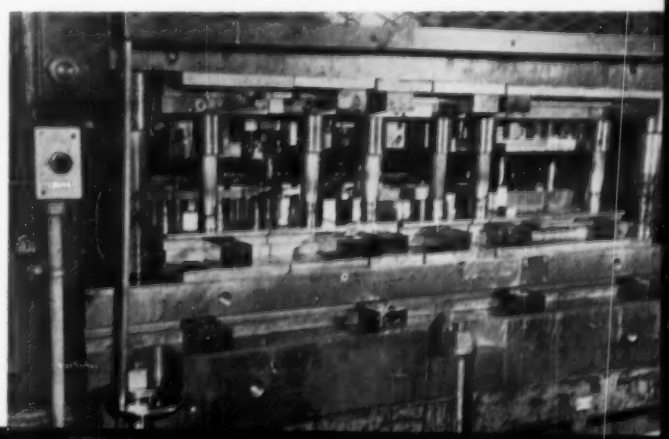


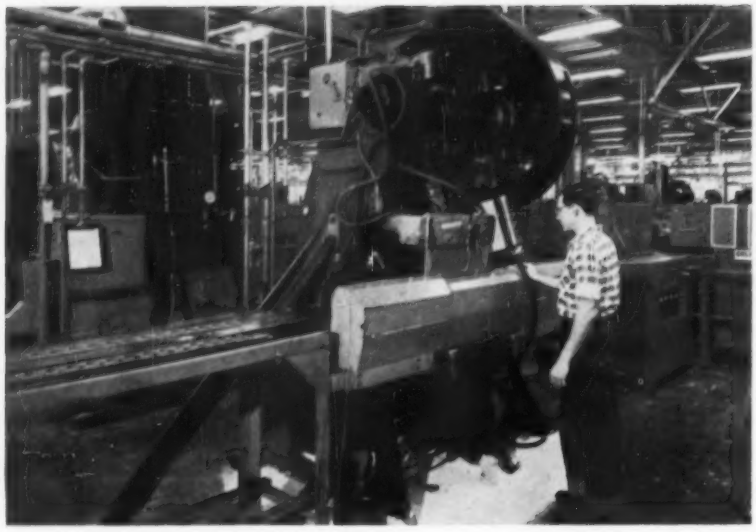
Five individual dies . . .

in a master dieset provide 5 stations for progressively stamping base plates. Feature is tapping heads that produce two 10-32 tapped holes at the fifth die station (fourth die unit). Heads are rotated by pressure exerted on the threaded tapping spindle from a spring-loaded pressure pad contacting the workpiece before the die bottoms. The spindle revolves four times as it is pushed upward through its supporting phosphor-bronze nut. Only 1½ threads are required in the 0.042-in.-thick stock. Tap life averages 20,000 to 25,000 parts. Tool cost runs about $40,000—includes all five stations and the master dieset

The author wishes to express his appreciation for the cooperation and help given him in the preparation of this material by the engineering staff of the Indianapolis Works of the Western Electric Company.

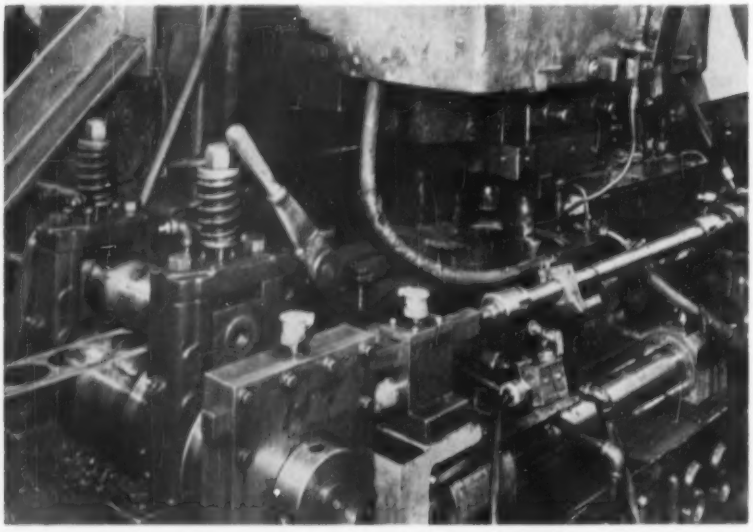
PHOTOS BY KENNY STRATTMAN





"Impossible" . . .

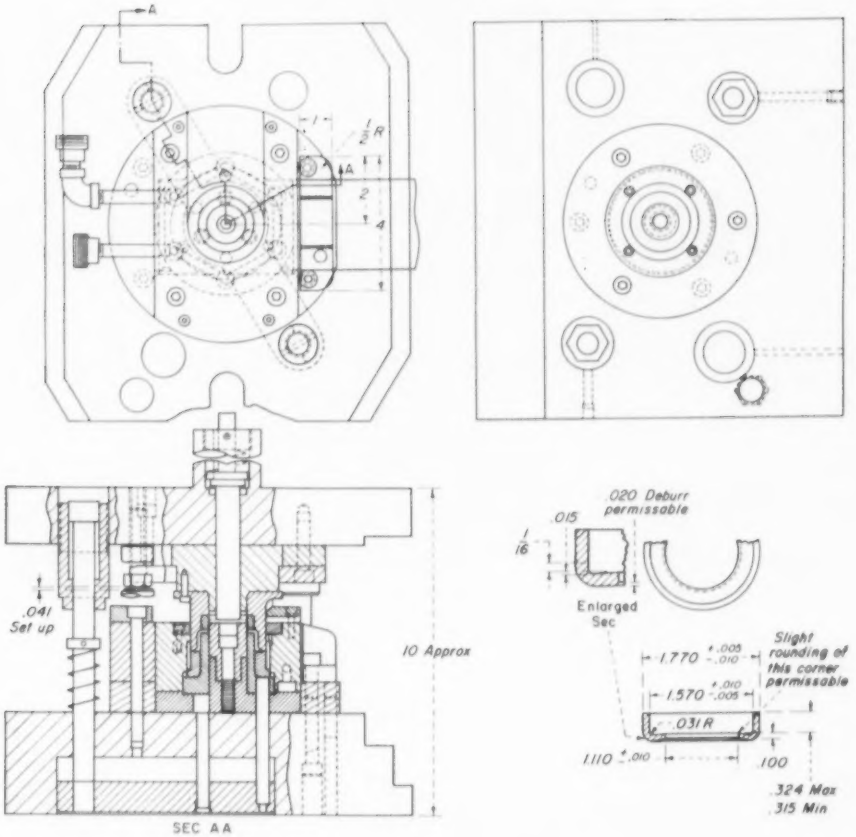
press-forming job is accomplished in this 60-ton press with a special 3-in. bolster. The press, a 30-kva induction heater, a special feed mechanism, and a compound die are combined to produce receiver magnets. Power for the induction heater is furnished by a 10,000-cps motor-generator set and converter through water-cooled flexible cables. Material is hard and brittle—consists of 0.100-in.-thick by 2¼-in.-wide strips of Western Electric-developed alloy. Called "Remalloy," it was designed especially for telephone applications and basically consists of 68% iron, 20% molybdenum, and 12% cobalt. The material can be machined only with great difficulty and it cannot be blanked or formed in a press when cold. As a result, a special induction heater was built to reciprocate in sequence with an automatic fixture that feeds four to eight foot strips to the die in 7-sec cycles. The heater raises the temperature of a section of the strip to 2300 F. after which it is immediately fed to the die because the material loses heat rapidly at room temperature—(cooling rate is 60 F per sec). Below 2300, the material will crack, above 2400 F its magnetic properties are impaired—so the heating and feeding devices must be fast and efficient



PERMANENT MAGNETS ARE STAMPED HOT...

Induction heater and die . . .

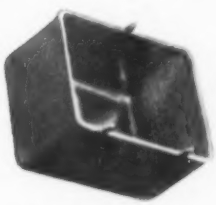
combine to press cup magnets. To eliminate sharp temperature gradients within the strip as it is being heated, the induction heater is reciprocated by a drum-type cam driven at 36 rpm by a ¼-hp gearmotor. Reciprocation back and forth over about 10 in. of the strip 4½ times each cycle is continuous and independent of the stock feed for full penetration of heat. Inconel tubes containing cooling water have welded-Stellite guide strips to receive the stock as it enters the heater and to contain it during the heating cycle—thus preventing warpage. When a heating cycle is complete, a timer cuts off power to the inductor coil and starts the stock-feed and press-operation cycle by energizing solenoid valves that control a double-acting air cylinder for operating two feeder rolls—one at each end of the fixture—and another cylinder that reciprocates the feeder carriage. This moves both pistons to the left, advancing the strip 6⅜ in. out of the induction coil and positioning a hot section of the strip under the punch. Two water systems in addition to that in the Inconel tubes are used—one for cooling copper-tubing heating coils, which could be adversely effected by radiated heat from the stock, and a third for the punch and die. Coils are specially formed "pan-cake" type over the top and underneath the strip for relatively high temperature needed through heavy stock



Compound die for cup magnets . . .

is hot-work die steel, hardened to R. 61-63 and ground all over. Water for cooling passages in two largest sections is recirculated through system that handles two presses. Altogether, four presses are employed to produce 6½ million magnets per year with material sorted within thickness tolerance of ± 0.008 in. so each setup has a spread no greater than 0.002. In addition, stock thickness is selected for each setup to produce parts to print dimensions depending on the amount individual punches and dies are worn. When bore diameter exceeds 1.573 in., no matter what thickness of stock is used, the die assembly is removed for repair. Punch and die elements are lubricated with oil to which graphite has been added each time a new strip is started. In operation, the outer punch produces a round blank which is forced into the die for forming a cup. Center punch then enters to pierce the hole, after which the hot cup is ejected into an enclosure at the rear of the press. Production rate runs about 385 pieces per hour

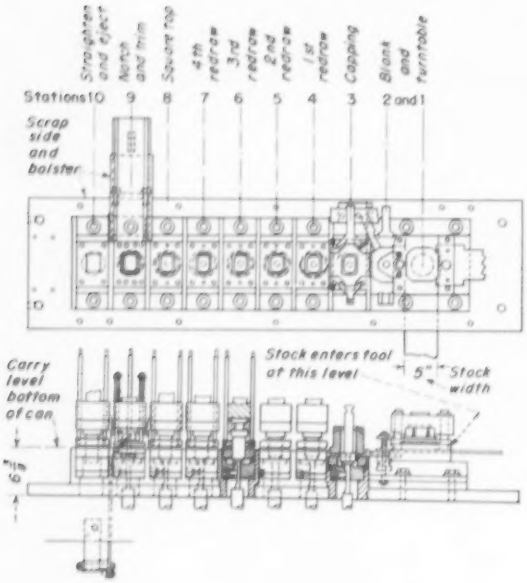
SQUARE CANS AND PRESS-TO-PRESS PROGRESSION . . .

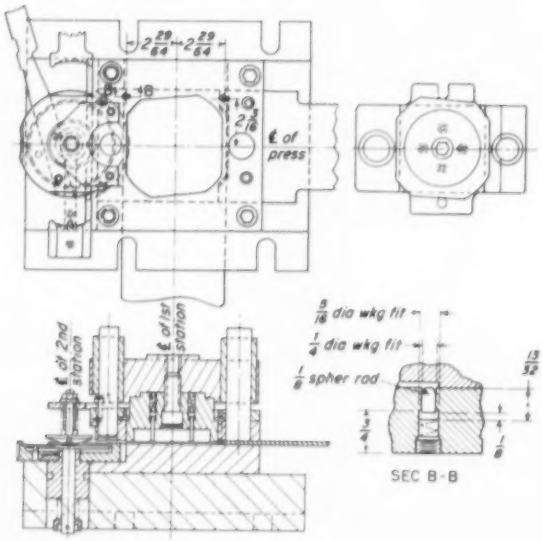


Square cans . . .

are made in this setup with a 10-station progressive die. Press has two lubricating systems—one for flowing a mineral-base organic-impregnated oil at successive operations on the part and the other for automatically feeding a measured amount of lubricating oil to each of 107 bearings periodically. Stock straightener, scrap cutter, and scrap bin contribute to the efficiency of this setup. One part in every 180 is inspected for evidence of galling dies and other visual defects—toolmakers are thus notified of die troubles as soon as they occur. Every 1800 strokes, depth of can is inspected, tool details are checked, as are the scrap chute at the trimming station, the transfer mechanism, and upper and lower cams for looseness or other obvious conditions that might cause failure

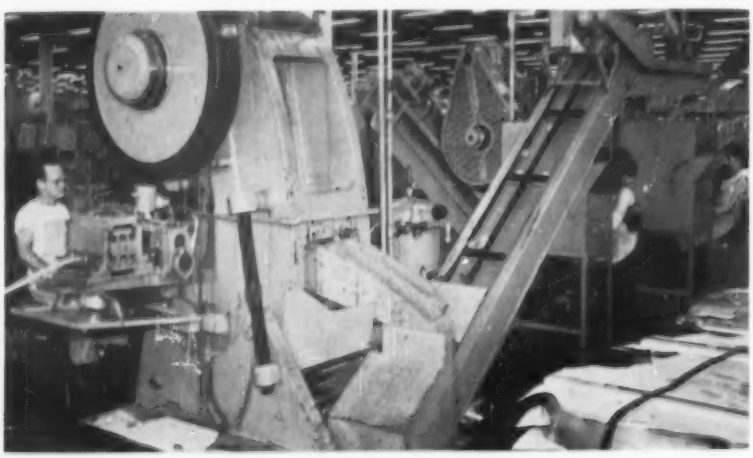
TOOLING BEHIND the TELEPHONE





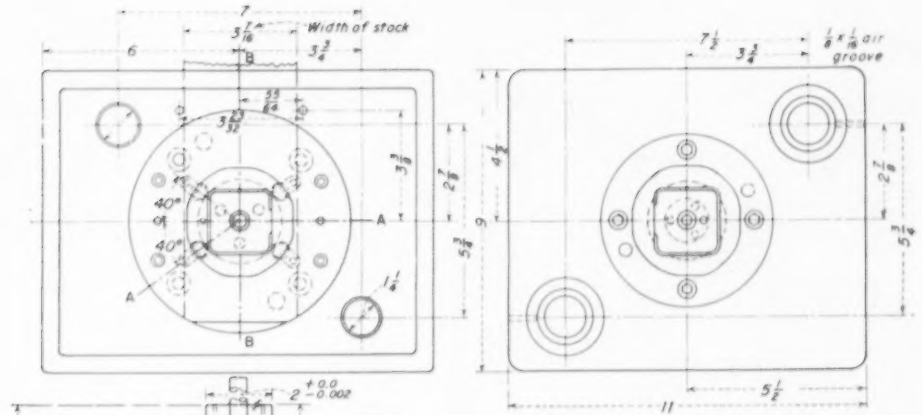
Rotating turntable . . .

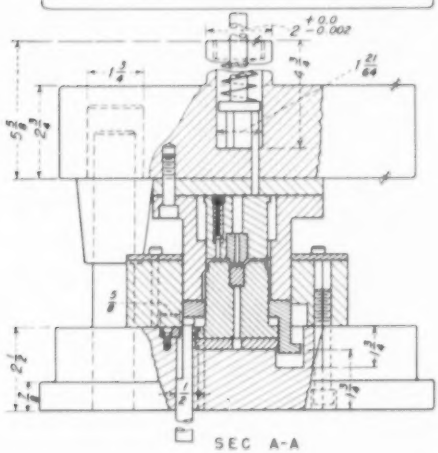
and transfer mechanism are features of this 10-station progressive die for square cans. Running at 30 strokes a minute, the die first blanks the strip, then rotates the blank through 45° to present corners to pickup fingers on transfer mechanism for positive handling. Third station produces the cup, followed by four successive draws, a flattening operation, trim and re-draw

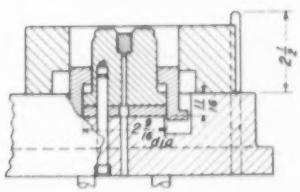


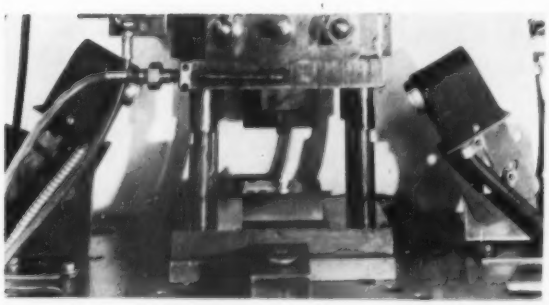
Four presses with connecting conveyors . . .

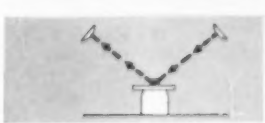
and simple tools speed production of connecting-block covers. First press blanks, draws and embosses, second and third trim edges and notch, third curls and perforates. Second and third presses are duplicates to maintain production rate of this group. At each press, die ejects work into conveyor for automatic transfer to the next. Quantities required are about 9 million per year—made at a rate of 2860 per hour on a two-shift basis in this setup

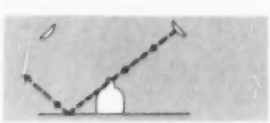










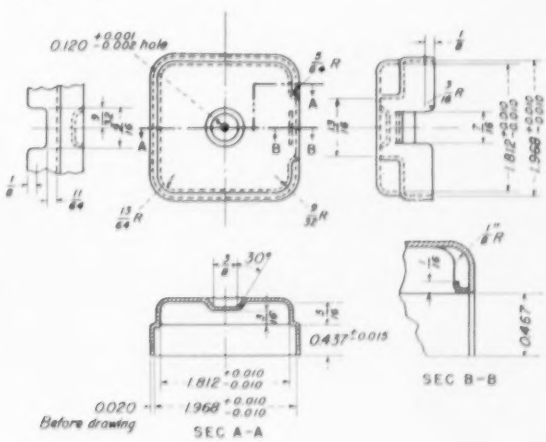


If a part is properly located in the die, the beam from the light source is reflected by the part to the photo electric cell which completes the circuit allowing the press to be operated.

If there is no part in the die, the beam is not reflected into the photo electric cell, consequently the incomplete circuit prevents operation of the press.

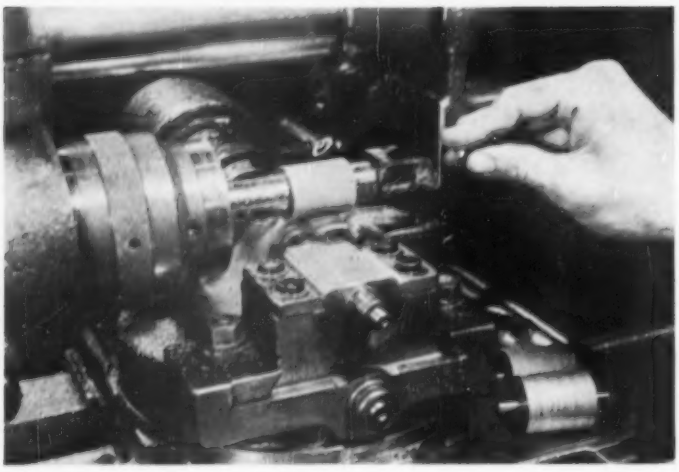
Electric eye . . .

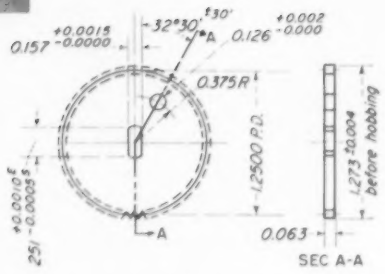
cuts maintenance costs in this die where the press cannot be run if a part is not properly located. In coining insulators for transmitter units, a properly located part reflects the beam from a light source to a photo-electric cell—completing a circuit that permits the press to be operated. When no part is in the die there can be no reflected beam, consequently, the incomplete circuit prevents press operation



One of three different dies . . .

employed for making connecting-block covers, this one is used in the first press for blanking, drawing and embossing 0.020-in.-thick by 3-7/16-in.-wide crs strip. Stock is electro-galvanized and bonderized with a minimum thickness of zinc on each side to 0.0002 in. These tools produce other parts of same shape and size except material and finish differs. All tools, like this set, are oil-hardening tool steel, hardened, and ground all over. The part, after stamping, is automatically degreased and given a coat of baked-walnut enamel. Defects checked are nicks, scratches, runs and sags





Carbide hobs cut costs . . .

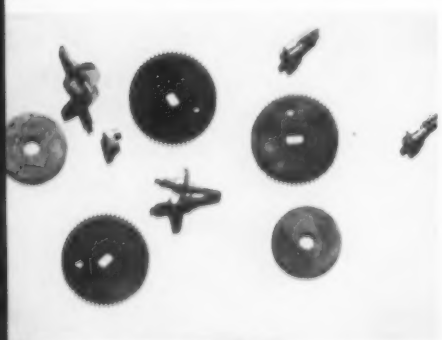
in the production of various small gears. In machining phosphor-bronze main gears, for example, 30,000 parts are made per grind, compared with 432 for HSS. Over 300,000 gears are made before a carbide hob is replaced, as compared to 8600 with HSS, and only 12 such hobs are used per year whereas 418 HSS hobs were needed. Hourly output jumped from 263 to 725

INGENIOUS MACHINING AND ASSEMBLY METHODS . . .

Machining ranges from simple drillpress setups to automatic screw machining with a multitude of automatic special-purpose operations in between. Automatic assembly operations are unique in that much use is made of specially developed machines made up of presses, indexing tables, automatic feeders, selectors, and other devices. Here, too, high-volume production is a prime consideration, coupled with close quality control. When practical, machines are automatically loaded and unloaded, however, many are manually attended for reasons of economy and, of course, accuracy.

Fixtures are ingenious — make best use of part geometry for locating accurately and quickly — some, for example, even make use of the cutting tool for clamping pressures. Altogether, over 30,000 jigs, fixtures and gages are in use and are subject to periodic checks for wear, damage, or other defects through a regular program carried out by 32 tool inspectors.

Quality control is especially effective in machining and assembly where process capability studies are made by measuring consecutive parts from a machine. Values, thus obtained are statistically analyzed by making a frequency distribution and an "$\overline{X}$ and R" (average and range) chart and calculating capability limits for the operation. If these limits and the engineering limits are compatible, process controls such as charts or gages are applied to cut scrap and improve quality.

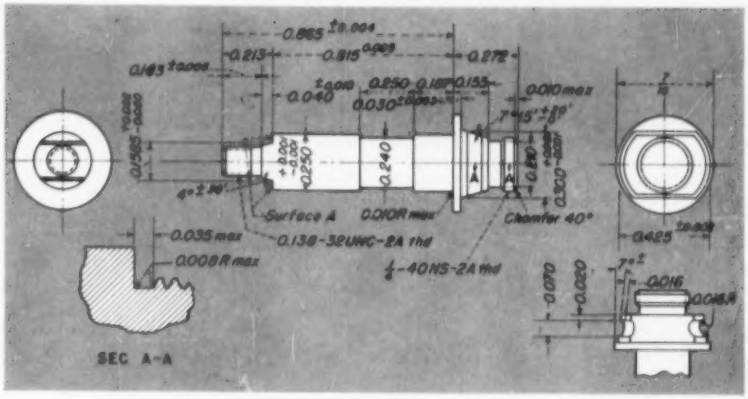


Over 90,000 gears . . .

of several different types are made per day—using aluminum, steel, bronze and other materials. Setups usually consist of gangs of 12 or 24 blanks of flat spur gears on one arbor. Seven large hobbers are employed for flat gears and 37 bench models for making smaller pinions

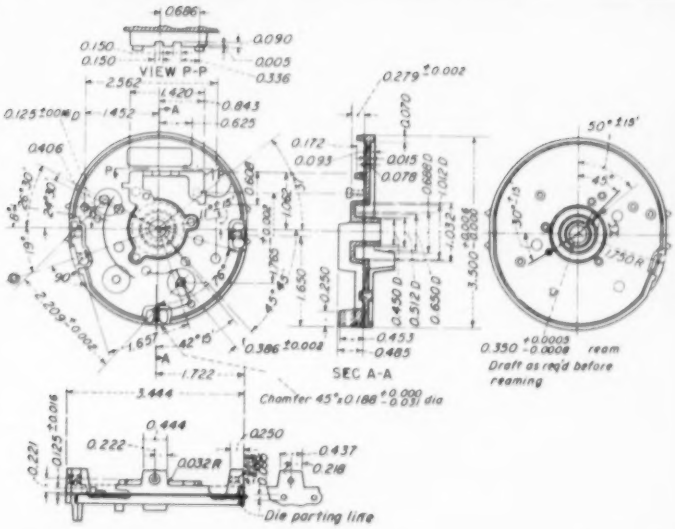
Broaching replaces milling in . . .

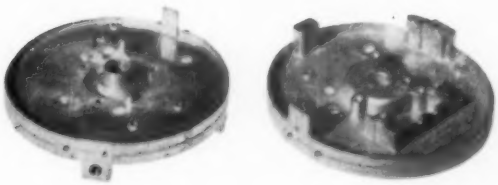
producing flats on dial mainshafts. Two such setups replace six milling machines, cutting cost of the part and reducing scrap considerably. Here, both ends of the shaft are broached simultaneously on eight shafts at a time—providing a production rate of approximately 1200 per hour. Fixtures are manually loaded and unloaded with the parts floating free. Cutting action of the broach provides clamping pressure



Flats are held within 0.003-in. . . .

total tolerance for equal distance relative to the centerline and they must be parallel to each other and perpendicular to the axis of the shaft within 2°. Made of 7/16-in.-dia. crs bar stock in multi-spindle automatic screw machines, these parts are required in annual quantities of 6.1 million. Close quality-control checks are maintained over the parts throughout processing to insure trouble-free operation in assembly





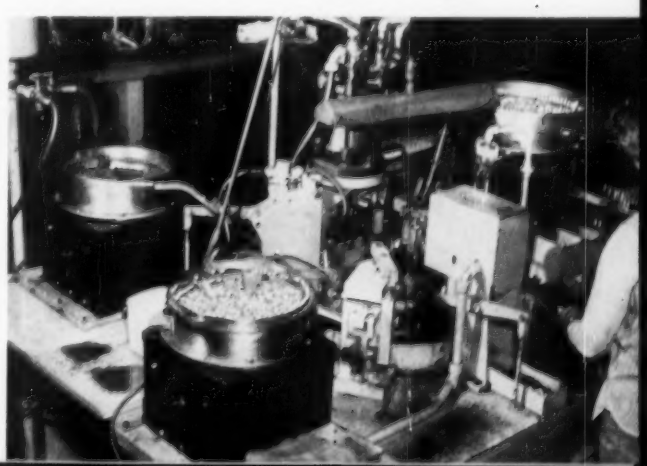
One of many multi-spindle machines . . .

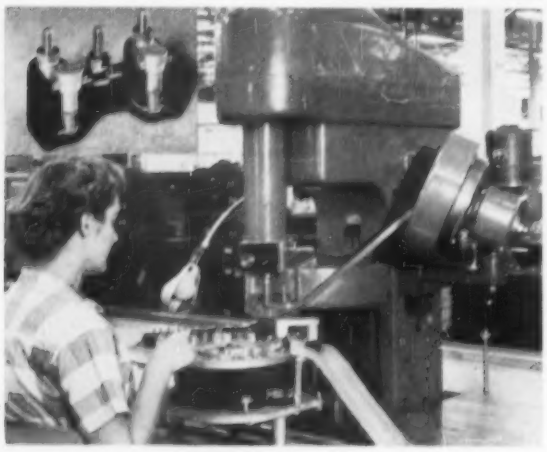
this one drills, reams, chamfers, countersinks, faces, and taps 27 holes in die-cast frames at a rate of 750 per hour. Parts are manually loaded from hopper on locating pins in fixture at first position and placed in pans. One part from every two pans filled is checked for size of tapped holes, size and perpendicularity of a reamed hole and associated surfaces

SUBASSEMBLIES ARE FAST AND EFFICIENT...

Automatic indexing . . .

setup has six stations and cam-operated rams timed to act in sequence for assembling protectors at 50 per minute. Brass caps are automatically loaded into nests in the rotary table from a vibrating hopper feeder at the first station. Fusible-alloy wire is cut to length from a spool at the second station, inserted into the cap, flattened and staked to act as a spacer. At station three, carbon blocks are loaded into the brass cap from another vibratory feeder. When holding vacuum is broken, block is stripped from the punch. At the fourth station, a ceramic protector block is loaded on top of the carbon block—again being fed automatically from a vibratory hopper. At this station, a locating pin on a horizontal ram holds the block in position until the punch on a vertical ram inserts it in the cap. Fifth station tests current flow through a 3-mil air gap. Rejects produce an electrical path that energizes a solenoid. The solenoid actuates a cam-operated ram that removes the defective part. At the sixth station two tabs are formed over open ends of the cap to contain the assembly. An ejector pin then raises the part out of the nest so an air blast can eject it into a chute



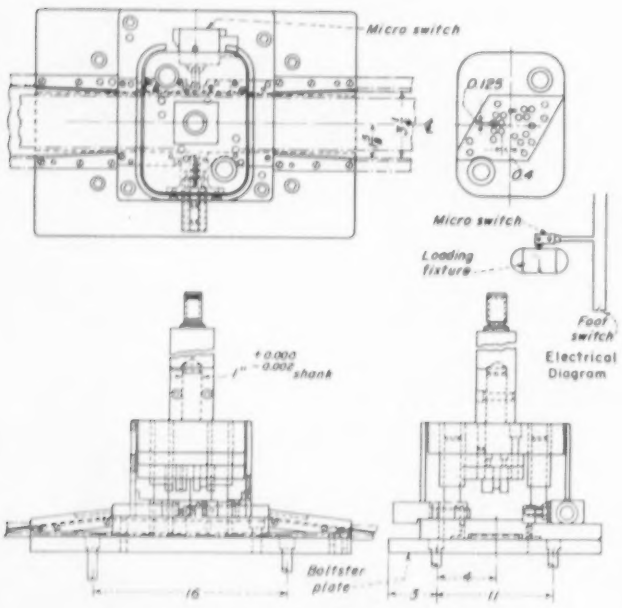


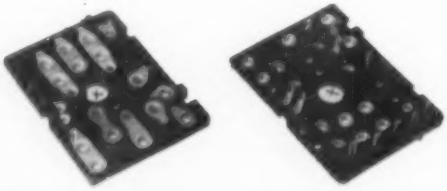
Automatic nut runner . . .

assembles hex nuts to posts on compression-molded phenolic-resin protectors. Protectors (top left) are carried on a belt conveyor—nuts are fed to a 36-station air-operated rotary table by means of a motorized-barrel-type hopper and chute. Because the three binding posts on each protector are 10° apart, 36 stations are possible. Operator loads the protectors into nests on the table, after which the rotating spindle runs the nuts. Before automatic ejection, studs are peened slightly to prevent loss of nuts. Outpu is 800 assemblies, or 2400 asembled nuts, per hour

Insert nuts . . .

and hex-head screws are automatically assembled in this indexing setup at a rate of 1100 pieces per hour. Aluminum protector base plates are manually placed in fixtures on the six-station rotary table. Insert nuts and screws are fed to the parts from separate barrel-type feeders—are assembled to the base at successive stations by means of air cylinders and automatic screw drivers. Automatic ejection is accomplished by air jet



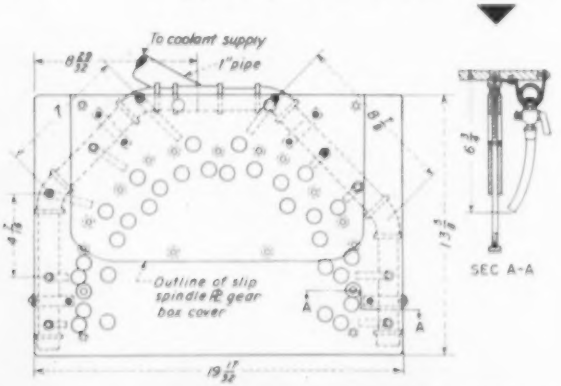


Conveyorized assembly . . .

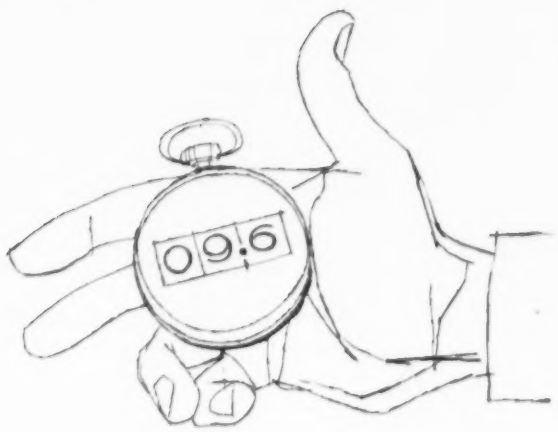
of terminals and eyelets is completed at a 10-ton press where previously positioned parts are staked in place. Operators at the conveyor use the left hand to load one fixture while the right hand loads another. Setting fixture stakes about 1200 terminal bases per hour, each with ten terminals and three eyelets. When loading fixture is located, it engages a limit switch at rear of bolster which excites pedal switch to actuate ram

Two at a time

is the tapping setup in this 30-spindle machine where terminal plates receive 15 tapped holes each. Machine is manually loaded and automatically unloaded—employs two guide fixtures with built-in coolant systems. Spring-actuated stop pin positions plate. As each piece is loaded, spring is contacted to actuate stop that engaged last piece in fixture. Production about 1900 per hr



Round Table



Tick-Tock Trig

"What's this crazy trig table all about, Al? Is Engineering going to change everything around here?"

"That's quite an idea, Ed. You see, they decided it would be easier to work with degrees and decimals of a degree, instead of minutes and seconds of arc. You like it?"

"It's just another crack-pot idea, Al. Every mechanic and machinist in the country is used to working with degrees, minutes, and seconds; and now the engineering department of this plant has to set itself up as an authority and change the standard. Why don't they stick to engineering our products, and leave standard data alone?"

"Now, look; Ed. You know as well as I do that it's a lot of trouble converting all your figures to minutes and seconds. When you're working to angles that close, it would be quite a help to be able to use tenths and hundredths of a degree—and just forget the minutes and seconds. After all, you can be just as accurate this way—maybe more so, because you stand less chance of getting confused."

"Not on your life, Al. Anything you change makes things difficult. Just ask any of the good old-time mechanics around here. They understand minutes and seconds of arc. It's your half-baked kids that have trouble, and Engineering is trying to make things easy for them. They might better learn how to do things right before they get even more confused."

"I'll admit the old-timers will be hard to win over, Ed; but that doesn't mean it isn't a good idea. All the old grumps like you have trouble with anything new; no matter what."

"It isn't the newness that bothers me, Al. It's just the fact that there's no point in upsetting the applecart when everything's going all right. Where's the advantage in using decimals?"

"It saves time, Ed. And makes things easier to figure out in your head. No converting back and forth."

"That's no trouble, Al. It's a part of figuring angles; just like part of the language."

"It's 'tick-tock trigonometry', Ed; and decimals make it easier."

***WOULD** it help shop figuring if all calculations for angles were in degrees and decimals of degrees; or is the established system with minutes and seconds too firmly entrenched? Your opinions may guide others with similar problems. Discussions of earlier topics start on page 242.*

You can make ball-bearing

Common problems to ball-bearing users are noise, life, load, and lubrication. At a special two-day meeting for electric-motor manufacturers, the New Departure division of General Motors provided concentrated information on the selection and use of ball bearings. Here are some of the highlights—of value to *all* users.

Properly applied and installed, a ball bearing will give a remarkable amount of trouble-free service. This is seen in all sorts of applications, including endless thousands of electric motors which go on for years with little or no service demands. Nevertheless, even better performance and greater insurance against failure are available to the user who follows recommended practice. Short-cuts can invite trouble.

It takes more than just a good bearing to get the best results. First, the bearing must be properly selected for the task it is to perform. Then it must be properly installed in the assembly. Mounting, conditions of fit, alignment, etc, can influence the service as much as the design and quality of the bearing itself. Seldom can maximum service be expected from a bearing that is forced to compensate for errors in the mount.

For most motor, and similar load, applications, the ball bearing makes minimum and relatively simple demands on the mounting environment—nonetheless, they are important. As applications get more complex and difficult, involving such factors as high speed and high temperatures or concentrated loads, the demands increase and it is more important to meet them. Compare the higher cost of making a field replacement in one of these complex units against the relatively slight added cost of initially providing the proper mounting conditions and techniques.

If you haven't looked into your use and assembly, and maintenance, of bearings lately, you may find it profitable now.

NOISE

As an ever-increasing number of ball bearings are used in industrial equipment, military devices, office machinery, and household appliances, the problem of bearing noise becomes more serious. Bearing noise is a complex and comprehensive subject. It is rare that noise results from a single factor. Generally, noise is the result of several factors. For this reason it is difficult to diagnose the cause of noise in a complete assembly. The indications may lead to false conclusions.

For instance, it is not uncommon to replace a "noisy" bearing and thereby reduce the noise level of the unit, only to find that the bearing removed from the noisy assembly will operate quietly when installed in another unit of the same design.

Rejections for noisy assemblies at the end of one motor manufacturer's production line average 2%.

After knockdown, the bearings removed are noise tested and found 80% acceptable. Putting these bearings through the line again results in another 2% rejection for noise. Thus, although rejections for noisy assemblies average 2%, the rejection rate for bearings contributing to noise approaches only 0.4%.

If noise is a problem, some degree of reduction can be obtained by tightening up on control of machining and assembly, particularly as these operations affect fit, concentricity, preload, and alignment. Similarly, bearings should be tested for noise, end play, and, if critical, for radial play upon receipt. Also, check storage conditions.

Noise as developed in commercially ground bearings has no effect on bearing life. Test results show that quiet and noisy bearings have equal lives and, furthermore, after a short period of operation even noise characteristics are equalized. However, noise caused by abuse can be expected to have a shortening effect on life, depending upon the severity of the effects of the abuse. Such things as contamination, severe Brinelling, and shield damage have been found to cause early failures.

Does bearing internal fitup affect noise characteristics? From a noise standpoint, the fitup most satisfactory for an application depends, first, on the design of the mounting, on whether or not the bearing is axially preloaded. For example, a loose bearing operates quietly under the proper preload. Without this preload, the bearing will rattle. Further, its noise intensity will increase with the amount of looseness. For a bearing mounted without axial preload, the lowest noise level occurs with a mounted internal fitup between 0.0001 in. loose and line-in-line. Decibel level has been plotted against internal clearance.

LUBRICATION

Probably the most important factor determining the life of ball bearings under any given set of conditions is lubrication. With the present mechanical components, materials, and manufacturing processes, choice of lubricant frequently determines load-carrying ability, life, maximum operating temperature, speed, and even corrosion resistance, Thus, it is increasingly important that the initial lubrica-

service better

tion in a bearing be proper for the task it must perform; that, if relubrication is done, the correct lubricant be used; that bearings with defective seals be replaced.

No one grease formula is applicable to all bearing applications, hence it is necessary to define bearing requirements accurately in terms of definite ranges of loading, speed, temperature, torque, humidity or contaminated atmosphere conditions, and required life. Then the best lubricant may be selected based upon lubricant viscosity index, viscosity under pressure, density, shear, oxidation rate, heat transfer rate, and the lubricant's ability to form and maintain at least a monolayer of oxide or other absorbed film on bearing load-carrying surfaces—without which lubrication is impossible.

Ball-bearing ring, ball, and retainer materials are now available which will allow temperatures in excess of 750 F—*if* lubrication can be maintained. However, accessories such as seals may become the limiting-speed factor because of their deterioration by heat generated in the bearing by grease churning and seal friction.

Generally, the criterion of limiting speed in a grease-lubricated, sealed, bearing operating under normal load and conditions is a temperature rise of 100 F. At higher temperatures, special seal materials, bearing materials, lubricants, lubricating methods, etc, must be considered. Efficient seals of high-temperature synthetic rubber will stand 350 F, silicone-rubber seals are on test for temperatures of 500 F and up, and metal non-contacting seals are available which are not influenced by temperature. Thus the problem reverts to lubrication again. For the normal 100 F temperature rise, speed is limited to about 3500 sfpm.

Isotope studies of oil in grease indicate that when a bearing is in operation there is a continual migration of oil from the remotest portion of grease in the lubricant chamber to the bearing load-carrying surfaces, although the bulk grease appears static. Thus additional available lubricant is beneficial under certain operational conditions. The problem for the bearing manufacturer is to evaluate how much extra grease volume should be made available for the required bearing life and stay in practical limits.

A sealed bearing can provide additional benefits. For example, a two-bore bearing was run at 21,000 rpm using gear lubricant of the non-fluid oil variety in the adjacent gear housing. This lubricant was successfully excluded from the bearing for 20 hr. Thus it is possible to use this bearing as a separator between a gear case and an armature, or in similar assemblies that might otherwise require special separators or packing. However, if the gear case is packed so full of lubricant that a pressure buildup occurs during operation, it is virtually impossible to prevent some leakage. By reducing the quantity of lubricant, hence eliminating the pressure rise, successful results have been achieved.

ASSEMBLY

Vertical assembly and alignment fixtures are recommended wherever these are possible, particularly on small motors and assemblies. Thus, there is less chance that the bearing will cock or bind as it is inserted and less danger of the shaft distorting the bearing or jamming. Methods and quality-control studies show a much lower rejection rate on vertically assembled units than on those put together horizontally.

Great care should be taken during replacement of bearings to assure that the mounts are not damaged, especially by nicks or deep scratches. Also, it is important to keep chips and dirt out of the mount when replacing the bearing as these contaminants may cause a slight misalignment, hardly noticeable, or excessive preload, that can increase noise and shorten bearing life.

Except for motorized-spindle applications such as high-speed milling and grinding heads, ABEC –1 or –3 bearing tolerances are usually sufficient for *motors* driving machine tools. On belt-driven equipment requiring high precision, any out-of-balance or perceptible vibration in the motor can be transmitted by the belt to the machine spindle and result in chatter or poor finish. Motor location considerably influences extent of vibration transmission.

Major causes of bearing noises in motors:

A. **Inherent bearing characteristics**
   1. radial clearance—too light or too loose
   2. separator-ball fit-up—too tight or too loose
   3. interference of shield with separator or cone
   4. excessive eccentricity
   5. excessive race to face run-out
   6. poor race finish

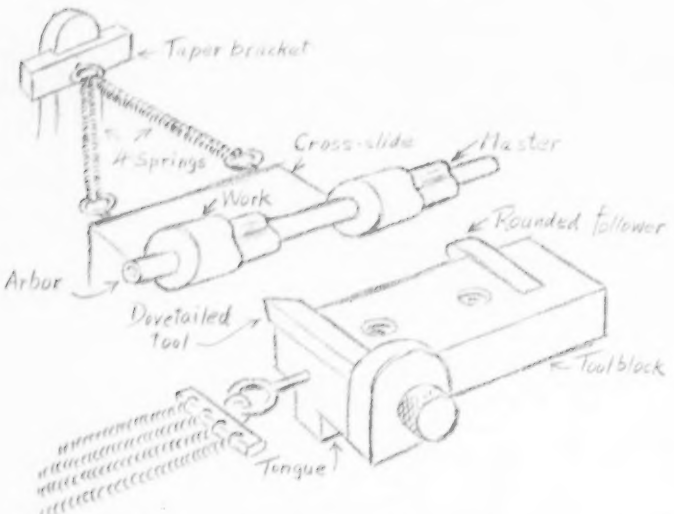
B. **Lubrication**
   1. excessive grease or grease crackle
   2. varnish on race and ball surfaces
   3. race damage from lack of lubricant

C. **Mounting**
   1. shaft fit—too tight or too loose
   2. housing fit—too tight or too loose
   3. out-of-round housing
   4. excessive axial preload
   5. poor finish—shaft or housing
   6. bent shaft
   7. misalignment
   8. interference of parts having relative rotation

D. **Bearing abuse or negligence**
   1. Brinelled races and nicked balls
   2. dirt and dirt indentations
   3. shield or seal damage and resultant interference
   4. rust

E. **Assembly practice (electric motors)**
   1. variation in air gap
   2. passage of current through bearing
   3. unbalance of rotating members
   4. windage of rotating parts
   5. resonance of frame, end bell, or fan

Practical Ideas . . .



Double Spring-Loaded Tooling Cuts Combination Cams

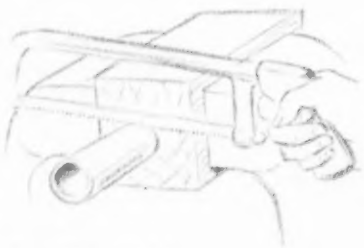
Spring-loaded tools for contour following aren't new, but this one is interesting because it has two spring-loaded rigs which make it follow a master in two directions.

The workpiece is a combined cam with a barrel (or cylindrical) cam at one end, with a face cam cut on a shoulder at the other end. These cam faces come together at the shoulder, so cutting would be quite difficult if we had not arranged this special tooling.

Two sets of four long springs each are used. One pulls the cross-slide toward the back end of the lathe—it's attached to the taper-attachment bracket by an adjustable eyebolt. The other pulls the tongued toolslide, which rides in the compound T-slot, toward the head end of the lathe—it's attached to a bracket on the headstock.

Work and master cam are mounted on a centered arbor. The single-point tool and a rounded follower are mounted parallel on the toolslide. Spring pressure from the headstock is adjusted so the springs will feed the tool at a reasonable rate of speed, and the back springs are set to make the tool and follower feed into the work. When the tool comes up to the shoulder where cylindrical and face cams meet, the spring to the headstock makes the tool move longitudinally to contour the face cam.

John J O'Wril, Methuen, Mass.



Cut Thin Tubing

One method of sawing thin-wall tubing is to drill a block of wood, choosing a drill to produce a hole that is fairly tight on the tubing. Insert the tubing through the hole, clamp the block in a vise, and saw.

Federico Strasser, Santiago de Chile

Tapered Guide-Pin Holes

Straight holes can be adequately tapered for guide pins with a tapered round file, held in a brace, and rotated counter-clockwise. This works in an emergency.

Arturo Camacho, Cebu City, P I

Toolbit from Drill Cuts Radiused Fillets

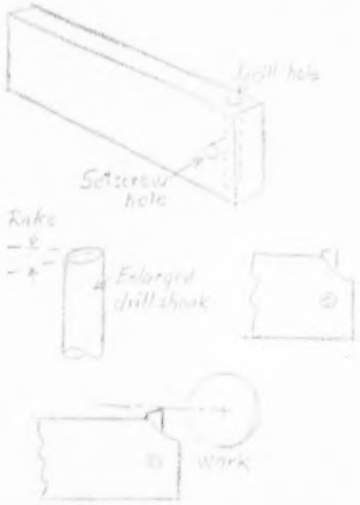
Any time you have to cut a radiused fillet that's half the size of an available drill—which amounts to the same radius as the drill—you can do it with a simple toolholder. Start with a machinable piece of stock the same size and shape as a regular toolbit.

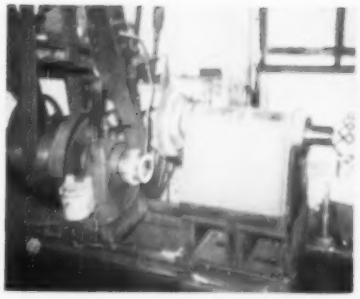
First, drill vertically through the stock the depth of shank (see illustration) and drill and tap a side hole for a setscrew. Now take the drill you used and cut it off just above the end of the flutes—which gives you a hardened round shank. Grind off the top of the drill shank at a moderate rake angle.

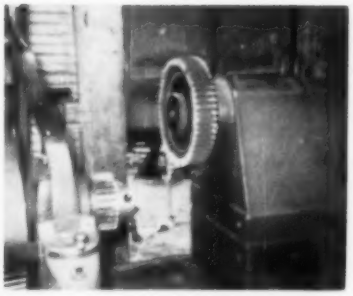
If the toolholder has to come up close to the work so the shank will cut to full depth, you can grind or mill away part of the holder. Turn the drill shank in the holder so the high edge is pointing into the middle of the fillet—usually 45°. Keep the tool tip right on work center.

In many cases it will help to shim up the side of the holder away from the filleted shoulder, thus producing a clearance angle. Cut straight in to depth, then move the tool longitudinally to produce a smooth radius.

Ralph C Otterson, Canandagua, N Y







Bolt-On Headstock for 40-in. Swing Converts Lathe in 20 Min

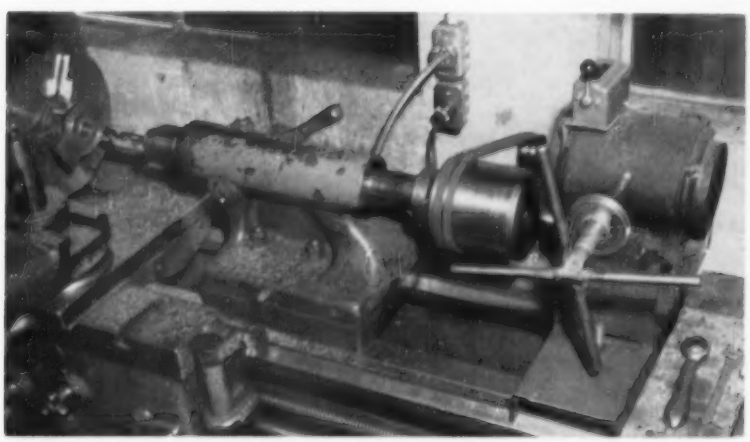
Our largest lathe is 24 in. by 15 ft, but we wanted to take on some larger turning work. Two things stopped us—we had no space for a larger lathe, and we doubted if the extra work we might handle would pay for the lathe, anyhow. As it turned out, we now do about 20% of our turning work with the auxiliary headstock we built.

It's simply a box-section weldment with spindle, bearings, and two gears that are driven from a gear mounted on the spindle nose of the regular lathe headstock. It fits in place in front of the regular headstock, with the gears meshing when it's bolted down.

We had to drill four bolt holes through the lathe bedways to hold the auxiliary headstock firmly, but we might have used clamps, which would eliminate changes to the original lathe.

The tailstock is equipped with a jacking platform bolted in place to raise it when we do center work. Otherwise, the lathe is in original condition, using the regular drive, gear speeds, and leadscrew feed. Note ratio of head gears.

W T Divine, Albany, Ga.



Really "Live" Tailstock Drills Chucked Work

Drilling speed with this rig is 450 rpm, composed of 150 rpm at the headstock, and 300 rpm developed by the motor at the tailstock.

The wide pulley on the tailstock spindle allows about 4 in. of feed travel as the tailstock is racked back and forth. Motor is ½ hp, and runs at 1200 rpm. New pulley gives different speed.

Horvick Electric Motor Co., Moorhead, Minn

Winner No. 243

W H HALLIDAY
Birkdale, England

won $25 in addition to regular payment for his idea:

SIMPLE SPRING COLLET

in the issue of Jan 2, 1956

An extra payment of $25 is made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

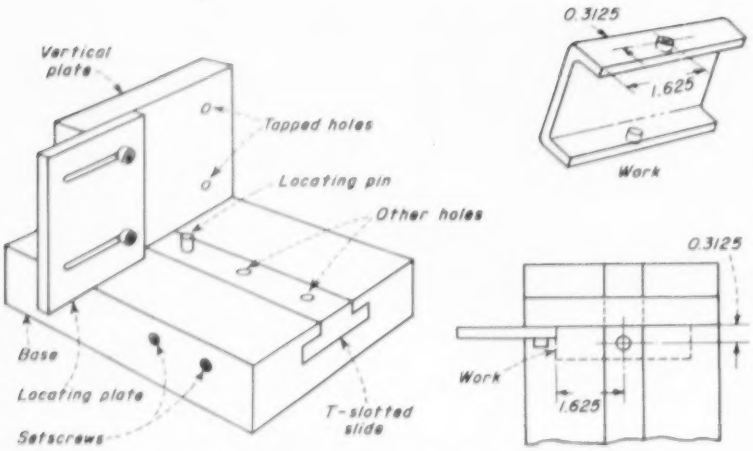
PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER—Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N Y



Drill Accurate Opposed Holes With Precision Angle Plate

Our production work often runs in batches of 25-50 pc, and instead of making up expensive drill jigs, we use this almost-universal angle plate to make sure opposed holes are in line. It's more work, but costs over several orders are less.

In this case the work was channeled casting, which we couldn't through-drill because the inside cast surfaces would throw the drill off. Outside surfaces were machined before drilling, so we had two dimensions to work with; both from flat, machined surfaces.

The angle plate has hardened-and-ground parts, including base, vertical plate, T-slotted slide, and locating plate that assembles with capscrews to either side of the vertical plate. Setscrews in the base lock the slide, which is drilled for short locating pins.

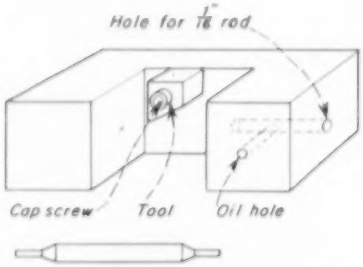
First we set up the locating plate vertical and 1.625 in. from the pin (center). Next we moved the slide to locate the pin 0.3125 in. from the vertical plate—and locked the slide. Then we indicated the pin from the drill spindle, locked the base to the table of the machine, removed the pin, and loaded the work to drill one hole. A simple parallel clamp holds the work in place while drilling.

The other hole is drilled after the locating pallet is moved to the other side of the vertical plate and relocated 1.625 in. from the pin hole.

This is done by replacing the pin in the slide, rotating the work 180°, and setting it on the pin. The pin actually locates the work; the plate aids in clamping.

The result is two holes in line to much greater accuracy than if we through-drilled.

Allan B. Nixon, Sprinfield, Mass.



"Pencil-Sharpener" Holder Tapers Drill Rod

For an order of 1000 armature shafts with tapers at both ends, we devised this simple tool and holder on the pencil-sharpener principle.

The rod was cut to exact length first. Then it was chucked in the spindle of a drillpress and brought down through the hole in the toolholder until it bottomed. After one end was done, we turned the work over and rechucked it to get the other end.

The toolholder was hardened and made accurately, including an oil hole that helped keep the work spinning rapidly.

John J O'Wril, Methuen, Mass

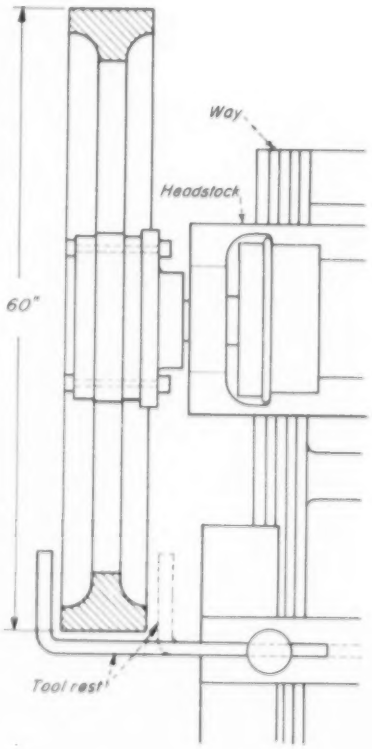
Turned Lathe Head Swings 5-ft Pattern

When we had to make a 5-ft gear pattern in a hurry, we were stuck for a machine on which to turn the blank. Finally, we hit upon rotating the head of a 15-in. lathe so the spindle overhung the side of the machine.

In this position, we could mount the blank on the spindle to turn the hub and outer rim. This was a woodworking job, so we could cut with hand tools and a rest made of bent steel stock held in the toolpost. But on a later occasion, we actually used regular metal-cutting tools and carriage and cross-slide feeds.

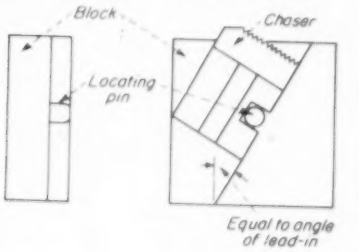
After turning the blank, we nailed on individual teeth that had been cut on a bandsaw, and were all set.

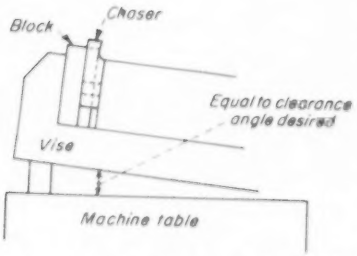
H H McNaughton, Knoxville, Tenn



Special Grinding Block Produces Chaser Lead-In

Once in a while we sharpen radial thread chasers, but we don't have a regular grinding fixture, so getting the lead-in is a problem. We solve it this way:





A special block is made to help set up the work on a machine vise. Part of it is cut away at the lead-in angle, and a locating pin is inserted to catch in the cam slot of the chaser.

The block is held in a vise, which may be jacked up at one end to produce the clearance angle. Then we grind all chasers to the same angles.

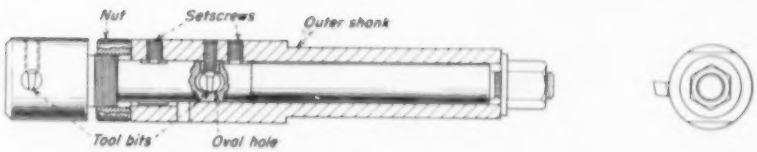
William Hartmann, Sheboygan, Wis

Automobile Tire Sections Cut Lathe Chatter

In our shop we often machine backup rolls 200 to 240 in. long, weighing 40 to 50 tons. We find we can prevent chatter marks on such rolls by placing sections of automobile tires between the faceplate lugs and the driver on the roll, when making finish cuts on body and necks. We cut the sections of tire about 4 in. wide.

We can also use sections of truck tires when lifting large castings with chain or cable, and protect the finish on the part.

Gene J George, Cheswick, Pa



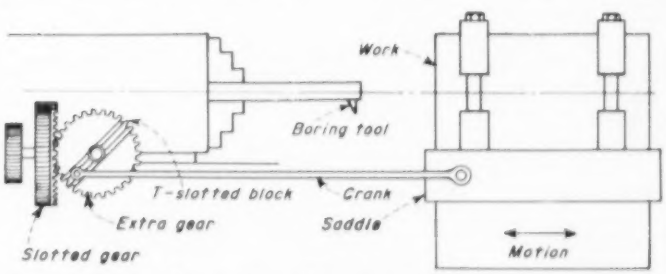
Double Grooving Bar Adjusts for Lateral Spacing

Two grooves inside a bore can be quite a problem, not because they're difficult to cut, but because they're hard to inspect and measure. Nominally, the distance between grooves cut by the tool illustrated is 3.312 in., but adjustments can be made within a span of about 1/16 in.

The outer shank fits in a lathe turret, and is bored to take a smaller boring-tool shank that carries the left-hand toolbit. Adjustments are made with the knurled nut, which acts on a threaded portion of the inner toolbar. Two setscrews through the outer toolbar grip the inner toolbar once the correct dimension between bits is set and checked.

The right-hand bit is held in an elongated oval hole, which allows it to be shifted to some extent. A key is provided to keep the bits to the same height, and a nut at the turret end of the bar allows tightening up on a threaded portion of the inner bar, to counter action of the knurled nut.

S. George, Grantham, England.



Geared Lathe Oscillator Produces Internal Oil Groove

We had a large number of nonferrous bushings which required figure-of-eight, scrolled oil grooves inside. We had no special machine, so we rigged an old engine lathe to do the job.

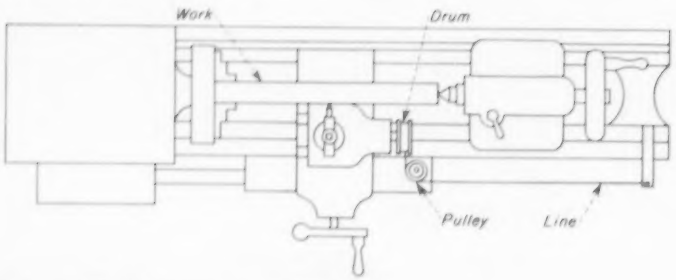
The lathe had no leadscrew, but still had the gearing for screwcutting. First we took one of the screwcutting gears; one that was toward the front of the lathe. We mounted it on a miller, using a dividing head, and cut radial slots around one edge to match the regular gear teeth. Then we replaced it in the headstock, and mounted a thin gear of similar size and pitch on a spindle mounted out from the front of the machine frame.

A T-slotted block bolted across the face of the front gear admitted a clamping block to which we attached a crank. The other end of the crank was pinned to the lathe saddle, on which the work was mounted and centered.

Finally, we mounted a boring tool in the headstock, and adjusted the crank throw to the required length of oil groove cut in the work.

N. Smith, Bradford, England.

(Note: Even though the gear with teeth cut on its side might work, a set of bevel gears could more easily and accurately be installed to work from the headstock and drive the crank—Ed).



Drum Takeup on Lathe Moves Compound to Cut Odd Threads

Sometimes you have to cut a thread for which you can't arrange change gears—like 12½ tpi. In such cases, if you don't need high accuracy, you can rig a drum and pulley to move the compound in addition to the carriage to produce the thread.

First, engage the nearest (next smaller) threading gears—it would be for 13 tpi in this case. Rotate the compound at right angles to the cross-slide, set up the tool, and mount a small drum in place of the compound crank. Attach a wire or light cable to the drum, wrap it around the drum several times, and run it around a pulley mounted on the carriage. Fasten the other end of the line to the bed down close to the tailstock.

As the carriage feeds left under threading power, the line will make the drum unreel slowly, which will advance the compound an extra amount to make up the difference between 13 and 12½ tpi.

Calculate the diameter of the drum required this way:

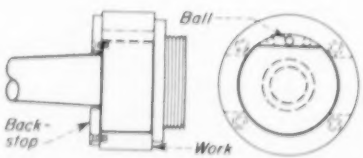
Normally, the lathe will cut 13 tpi. To get 12½ tpi, you must move the compound along by an extra amount—½ of 1/13 in. for each in. of thread cut, or 1/26 in. This is 0.03845 in.

Now assume your compound moves 0.200 in. for each complete revolution of the leadscrew. Divide 0.03845 by 0.2—0.1922. This is the amount the compound will advance the tool for each drum rotation.

Next divide 1 by 0.1922 to get the circumference of the drum, and divide the result—5.2 in.—by pi to get the dia—1.65 in.

Sometimes this dia may come out too small to be practical. Either use the next smaller size threading gears, or double the drum dia. If the drum is doubled, use a double pulley by replacing the anchor at the tailstock with another pulley, and run the line to an anchor on the carriage. Note—if the line is thick, you may have to compensate for it by shaving the drum dia.

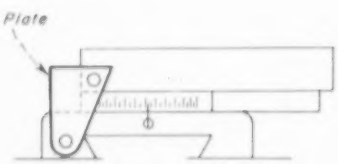
W H White, Oakland, Calif



Wedge Lock Holds Cups

Cup-shaped work can be held while turning the OD with a simple mandrel turned to fit the ID of the work, then milled to produce a flat on one side. Inside the flat rides a bearing ball that locks against the ID of the work as it rotates. To release, just rotate it in the other direction.

James Baird, Rochester, N Y

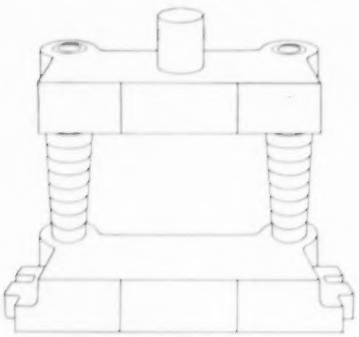


Adjustment Plate Helps Set Taper

Instead of tapping the compound when setting a taper on the lathe, I use a small plate attached to the carriage, and adjust a bolt through the plate—touching the compound—to inch it over. This prevents overshooting the mark when you have measured your preliminary cut and need further adjustment.

The top hole is tapped for a fairly snug fit on the bolt. The bottom hole is simply drilled.

A Wallace, New Rochelle, N Y



Protect Die Posts With Spiral Springs

Die posts get beat up from dirt, chips, and scrap, especially if there's an air ejector on the press. One way to cut the damage is to install spiral-wound spring steel.

A set of guards can be left at each press, to be wrapped on the die set when a new job is set up. Width of the steel stock depends on press shut height, open height, and size of the average posts being used. If the steel is wrapped from the bottom up, its edges will overlap and prevent dirt from falling inside.

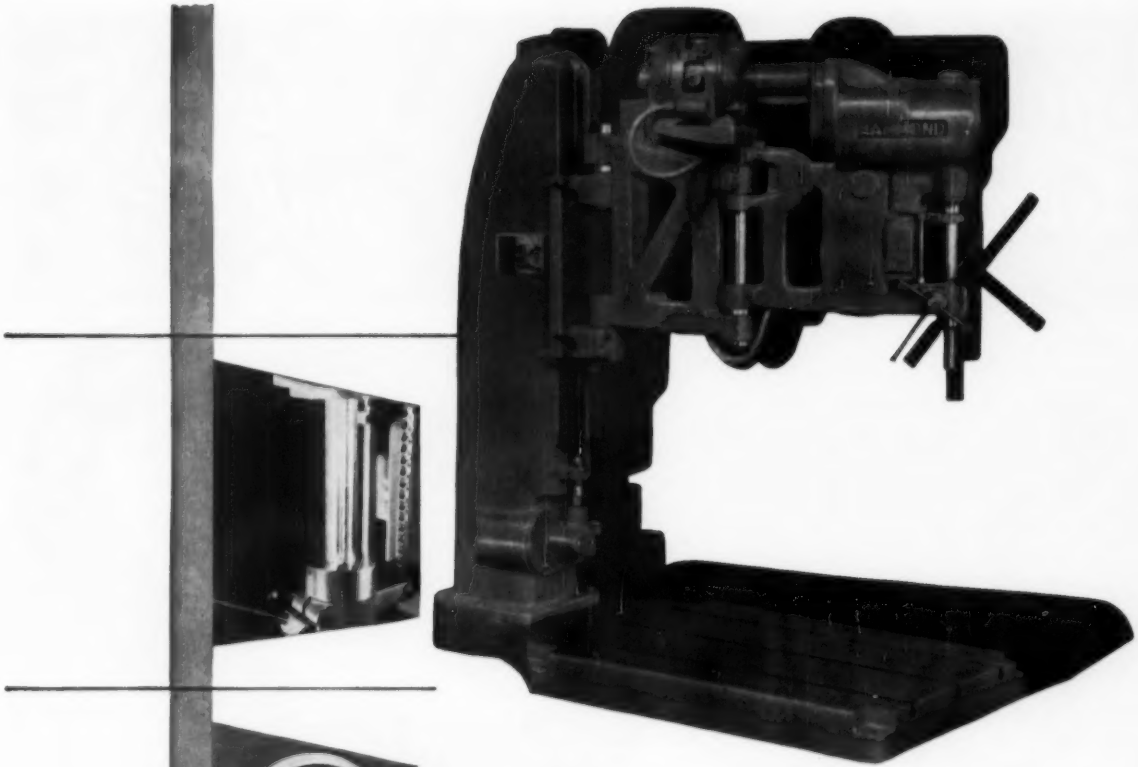
Raymond Jones, Poughkeepsie, N. Y.

Lock Soft Parts Together

Two aluminum parts had to be fastened together securely so they would resist pulling apart; also resist torque. The answer was a serrated washer, of which there are several types.

The washer embeds itself in both parts when they are squeezed in a hydraulic press. The washer must be hardened. It works as well between parts made of other metals, as long as they are softer than the washer.

Mark Bramsen, Valley Stream, N. Y



FOOTBURT

FOR *faster* RADIAL

DRILLING AND TAPPING

■ Hammond Radial Drilling and Tapping Machines may be spotted in the production line for drilling, tapping or reaming. With its unique Bracket Type construction the spindle can be swung quickly from hole to hole. Six Quick Speed Changes are instantly available and the Hammond Tapping Reverse is very fast and convenient to operate.

THE FOOTE-BURT COMPANY

Cleveland 8, Ohio

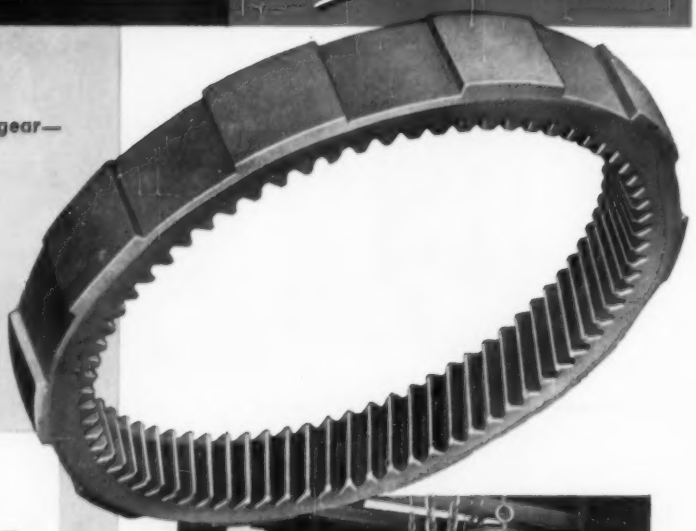
Detroit Office: General Motors Building

engineered for production

FOOTBURT

MACHINE TOOLS

Broach Your Helical Transmission Gears *and Cut Your Costs*



This is a 73 tooth automatic transmission gear—5.5853 P.D., 14 pitch, 20° pressure angle.

It is broached in just one pass. A single shaving operation completes it.

All critical dimensions including lead and concentricity are held to extremely close tolerances.

Broaching time	25 Seconds, **floor to floor**
Shaving time	40 Seconds, **floor to floor**
Total machining time	65 Seconds

The 7 foot Naloy Broach used also chamfers the gear tooth edges as it cuts the teeth.

The constant and intimate contact Red Ring engineers have with advanced gear practice gives them a very real advantage in the design and production of gear tooth broaches.

Write **for specific suggestions on your broaching operations.**

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

7332

Abrasive-Blasted Surfaces . . . I

WILLIAM A. BEYERS, manager, Supply Dept, PANGBORN CORP, HAGERSTOWN, MD

Abrasive blasting is most commonly used industrially to clean metal surfaces of scale, rust, paint, encrusted sand, dirt and other undesirable materials, and to prepare surfaces for applied finishes such as metallizing, enameling and painting.

Many types of surface finishes and surface effects can also be obtaned by abrasive blasting in steel, non-ferrous metals, plastics, glass and even wood.

Several factors can be varied to produce different effects such as:

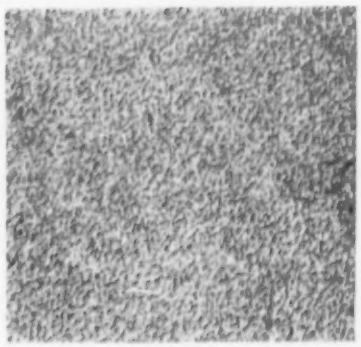
1. Characteristics of the abrasive, including hardness, shape, size.
2. Pressure or force with which abrasive strikes surface.
3. Time of exposure to blast.
4. Equipment.

Abrasive Hardness—There are four classes of abrasives available commercially with several types and grades in each class as is shown in Table 1. Hard abrasives shown in column 1 will give a heavy indentation to a metal surface to provide minute pools for holding enamel and similar applied finishes. The materials in column 4 are soft and will clean surfaces with a gently wiping action.

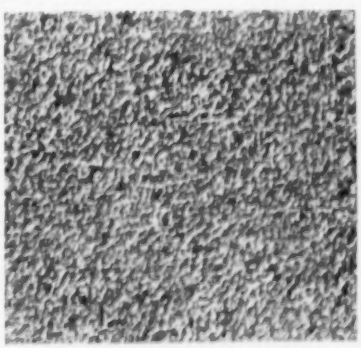
Abrasive Size and Shape—Abrasives are classified as shot or grit. Shot can be steel, chilled cast iron or malleable cast iron made as nearly spherical as manufacturing processes will permit. Shot has the effect of peening and hammering the surface. Any scale adhering to the surface is cracked, lifted and removed by the force of the blast. Grit is irregular and has many cutting edges. The grit cuts the surface and gives a matte finish that is excellent, for example, in providing "tooth" for paint.

In Figs. 1 and 2 are illustrated the different kinds of surfaces that can be obtained with shot and grit.

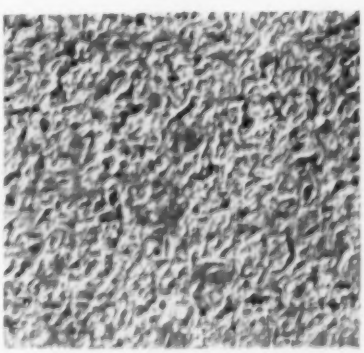
Although shot is round when new, it may crack and break into irregular shapes after a number



GRIT 200



GRIT 50



GRIT 25

FIG. 1 . . . Surface finish on abrasive-blasted steel plate varies with the grit size. Magnification, 10 X

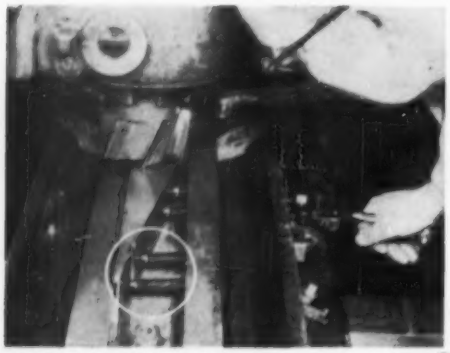
Table I . . . MOST COMMONLY USED ABRASIVES*

Metallic Abrasives	Artificial Abrasives	Natural Abrasives	Agricultural Abrasives
Chilled Cast Iron	Silicon Carbide	Garnet	Cocoanut Shells
Cast Steel	Aluminum Oxide	Quartz	Black Walnut Shells
Malleable Cast Iron	Glass Beads	Silica	Pecan Shells
Crushed Steel	Refractory Slag	Decomposed Rock (Novacite)	Peach Pits
Cut Steel Wire	Rock Wool Byproducts		Filbert Shells
Aluminum			Cherry Pits
Brass Shot			Almond Shells
Copper Shot			Apricot Pits
			Rice Hulls
			Ground Corncobs

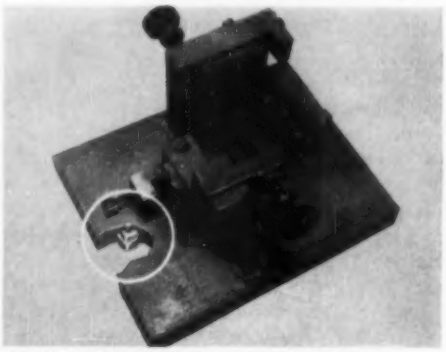
*Each group listed in order of decreasing hardness

What can be done to lower YOUR tooling costs?

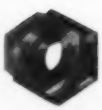
Thousands of companies are making drastic savings by using standard Vlier Tooling Specialties instead of costly custom-made substitutes. The applications shown below are only the *obvious* uses for these simple, inexpensive tooling specialties.

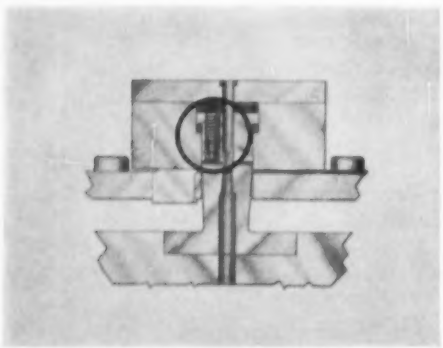


CLAMPING OFF-ANGLE PARTS in jigs and fixtures is a cinch with Vlier Swivel-Pad Clamps. Pad swivels on a ball, 7½° each side of center line. Can't bind or damage part surface. Socket set models can be inserted from either end.

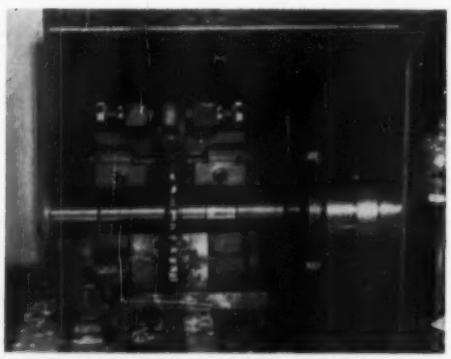


PERFECT ALIGNMENT OF JIGS AND FIXTURES ON MILL TABLES is assured every time with Vlier Fixture Keys. Each key is precision machined to three table slot dimensions, enabling the job to be run on any suitable mill in shop.





NEED ACCURATE, UNIFORM SPRING LOADS? Vlier Spring Plungers really pay off when positioning parts in jigs and fixtures. Spring loads are accurately set at the factory; stay constant. Plunger telescopes completely.



THE RIGHT AMOUNT OF CLAMPING PRESSURE AND NO MORE! There's no distortion of the part when Vlier Torque Thumb Screws are used to clamp it in the jig or fixture. Once predetermined end pressure is reached, the head turns freely. Working parts are protected from foreign matter.

Where can your tool room save?

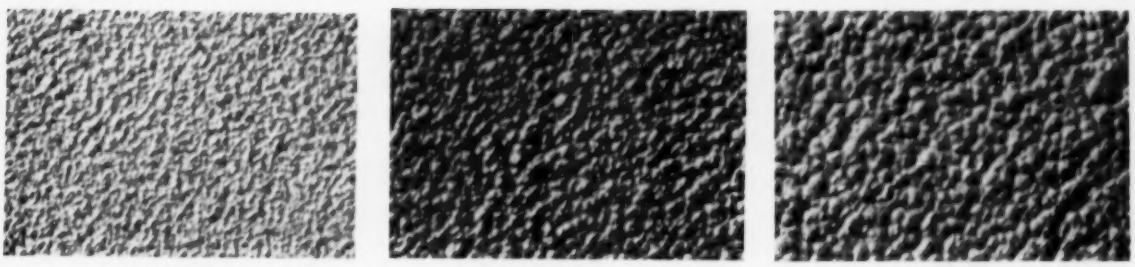
Chances are, you can think of dozens of uses for standard Vlier Tooling Specialties—applications where expensive, complicated, home-made devices are now being used. *Why not write for your copy of the new 1956 Vlier catalog today?*

Originators of small parts that make a big difference in tooling costs!

VLIER ENGINEERING INCORPORATED

8900 Santa Monica Blvd., Los Angeles 46, California

Abrasive-Blasted Surfaces... II



SHOT-110 SHOT-230 SHOT-390

FIG. 2 . . . Different sizes of steel shot also produce various surfaces on aluminum plate. Magnification, 10 X

of passes. This is particularly true of chilled cast-iron shot. If the abrasive cleaning system is not carefully watched, to make certain that the balance of fine, medium and coarse sizes in the circulating system is maintained, the nature of the surface produced will change as the percentage of fine particles increases.

When a new blast cleaning machine is started up, the original load of abrasive should contain coarse, medium and fine particles —certainly two sizes. As the abrasive is used, natural wear creates the fine sizes. Therefore, the coarse size should be added to the circulating load in the future to maintain a balance of grain sizes and a uniform finish on the surfaces being cleaned. A coarser surface will be obtained with all new, coarse abrasive, as compared with surface obtained with a balance of coarse, medium and fine sizes. "Coarse, medium and fine" may mean a different range of grain sizes when blasting different types of surfaces. Fig. 3 illustrates what may happen after many passes with cast-iron shot.

Particle size has a definite effect on the surface produced. The coarseness or fineness of the finish is determined by the coarseness or fineness of the abrasive grain used. *The finer the abrasive, the finer the surface* as illustrated in Figs. 1 and 2. The thickness of the material being blasted may limit the size of abrasive. Large particles, being heavier, strike the surface with greater force. It is quite possible that a thin section may be warped by particles that are too large.

Smaller particles, working like minute chisels or ball hammers, give a closer, more uniform coverage with less chance to miss part of the surface.

In Table II is shown the great difference between the number of pieces per pound in the various sizes of steel shot.

Force of Blast—An increase in the force with which the abrasive strikes the surface will increase the depth of penetration, using the same abrasive. The greater the force, the rougher the surface or the deeper the cuts and holes will be. In Fig. 4 are shown the surfaces obtained on stainless steel with grit and air pressures of 40, 60

FIG. 3 . . . After 1500 passes, No. 230 chilled-iron shot has broken down like this. Magnification, 10 X

Table II . . . STEEL SHOT PER LB

Size	Pcs per Lb
S-70	10,500,000
S-110	1,150,000
S-170	505,000
S-230	305,000
S-330	90,000
3-390	55,000
S-460	30,500
S-550	24,000
S-660	13,000
S-780	8,100
S-930	5,150

Sun's Heavy Duty Emulsifying Cutting Oil excels on high-alloy aircraft steels

S.E.C.O. Heavy Duty handles all machining jobs requiring an emulsifying cutting oil. Piasecki Helicopter's large job shop at Morton, Pa., found this out three years ago when S.E.C.O. HD* replaced two expensive heavy-duty soluble oils in machining fan hubs.

Extremely versatile and moderately priced, S.E.C.O. HD has been doing an exceptional job in cutting a variety of high-alloy aircraft steels for Piasecki.

For more information about S.E.C.O. HD, see your Sun representative. Or write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AM-4.

WRITE FOR FREE TECHNICAL INFORMATION

- *Cutting and Grinding Facts*
- *Disposal of Waste Emulsions*
- *New Improved S.E.C.O.*
- *S.E.C.O.—Mixing Instructions*
- *S.E.C.O. HD*

SUNOCO

*TRADE-MARK

INDUSTRIAL PRODUCTS DEPARTMENT

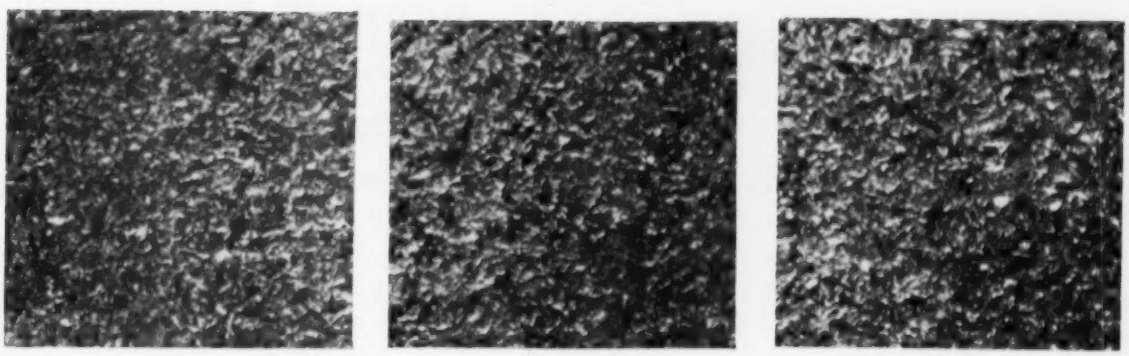
SUN OIL COMPANY

Philadelphia 3, Pa.

© SUN OIL CO.

IN CANADA: SUN OIL COMPANY LIMITED, TORONTO AND MONTREAL

Abrasive-Blasted Surfaces... III



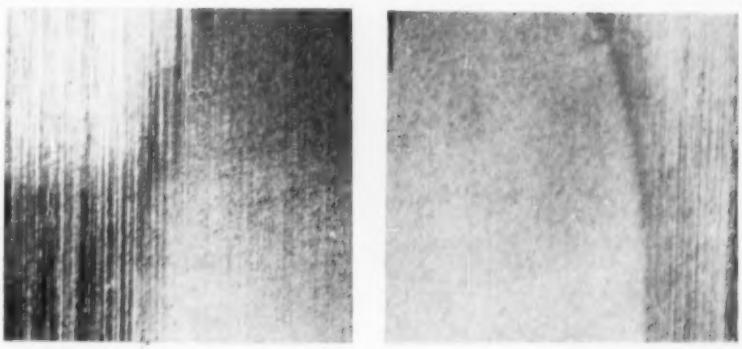
40 PSI 60 PSI 80 PSI

FIG 4 . . . Surface finishes produced on stainless steel will vary with the blast pressure. Magnification, 13 X

and 80 psi. Profilometer readings on these surfaces show a difference of about 15% in surface roughness for each 20 lb increase in pressure in the range studied.

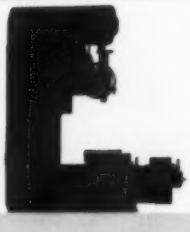
Time of Exposure—The chief effect of the length of time the stream is directed at the surface is removal of material. The character of the surface does not change. The two photomacrographs shown in Fig. 5 were taken on the same stainless steel plate, one showing the effect of two seconds of blasting used and the other 30 sec. More metal has been removed in 30 sec than in two seconds, but the surface maintains its original contours and is not rougher. It is actually smoother because the grinding scratches on the plate have been removed completely in 30 sec. Additional time of exposure over 30 sec would not change the nature of the surface.

Type of Equipment—Except for extremely fine abrasives, which can only be handled effectively in a water slurry, the type of equipment used has no appreciable effect on the surface obtained. The same type of surface will be obtained, for example, with shot or grit whether it is delivered by centrifugal force or with compressed air and nozzle. Special effects, however, can be more easily achieved with a nozzle because the stream can be directed over more precise areas than with other methods. On the other hand, when a great volume of parts or large areas are to be finished, such as sheet stock or plate, lower costs will be obtained with automatic, centrifugal blast machines.



2 SEC 30 SEC

FIG. 5 . . . Time affects the surface finish produced by blasting stainless-steel plate. Magnification, 13 X



NEW QUILL BEARING DESIGN helps achieve extreme precision in Fosmatic Jig Borer

Eight models available from the low-cost Model 30 with 36" x 18" table, to the virtually automatic model 54P with 54" x 22" table. Other important features: Automatic Positioning, choice of two precision measuring systems, milling feed, rapid traverse to quill, power clamping of table and saddle, coolant system and reversing motor control for tapping.

To bore with precision as close as ±.0001", distance between cutting tool and lower quill bearing must be held to a minimum. Here's how Fosdick minimizes this crucial distance.

The lower quill bearing is *permanently* located at the lowest possible position in the head, permits boring with spindle nose as close as 2½" to the bearing. Bearing does not ride up and down with quill and spindle as in conventional designs where balls are held in moving bushings.

The permanent location of quill bearings is made possible by unique Fosdick design—vertical ball races with preloaded precision balls circulating continuously. This design also permits spindle and quill to be shorter; thus stronger and more rigid. Both are perfect cylinders with no cuts on the outside.

Engineering advancements like this make the Fosmatic Jig Borer the most rigid and precise boring machine you can buy. Write today for the new catalog.

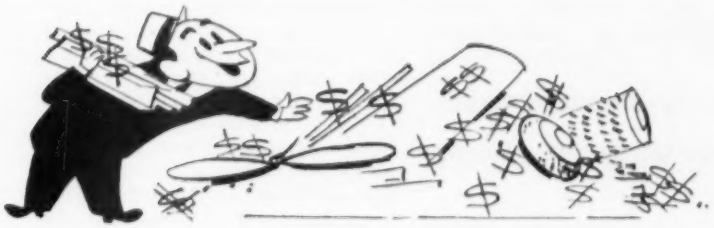
NEED JIG BORING EQUIPMENT? GET A PROPOSAL FROM FOSDICK!

Fosmatic Radial Drills | Jig Borers | Sensitive and Upright Drills | Sensitive Radial Drills | Jig Grinders | Automatic Positioning Jig Borers

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

FOSDICK

Talking Shop . . .



$ Million Scrap

CONVAIR-SAN DIEGO sold $1,070,145 worth of salvage materials in the past year, according to Joseph Freeman, who has charge of the salvage department. More than half, or $510,560, came from aluminum scrap, sorted and sold back to producers. Used shipping crates, Fiberglas cloth, and miscellaneous materials amounted to $396,227. Trash, rivets and metals other than aluminum brought $163,358.

Trash and floor sweepings are raked over a grid in the salvage yard. Metal items pass over a magnetic wheel which picks out steel parts. Rivets and other heavy nonmagnetic items are sorted out in a vibrator, then wood and cardboard are taken out, cardboard is baled (60 x 40 x 30 in., 650 lb). Small hardware items go to outside companies employing handicapped persons to sort them; other metals are classified by type at Convair. Employes may buy what they will two days a week; the rest goes to dealers.

More Balance

AT LEAST 70 rotating parts of a GM automobile are now balanced before assembly. Most of them are in the engine, which is also balanced before it goes to work.

Life Times Four

ENGRAVO-CRAFT Co, Kalamazoo, Mich, makes baked-enamel topped aluminum panes for automatic-pilot analyzers. Best output for usual engraving bits was a half panel per grind, because lines are very fine—only 0.02 in. wide. Now Stellite 98M2 bits are being used, and raised output to two panels (394 letters) per grind, or 24 panels per tool. Bits are ⅛-in. dia by 1 in. long, ground at 25 to 35°.

Ghost Motor

MINNEAPOLIS-HONEYWELL has developed a motor that doesn't run! Engineers designed the "ghost" to solve a costly problem in testing switches and relays. Real motors—some costing $200 each—wore out faster than the equipment being tested. The "ghost' motor can't wear out because it has no moving parts. It is an ingenious arrangement of resistors and inductors that duplicate the electrical behavior of a real motor.

It is like the little man who wasn't there in another respect, too. It is installed in a house in which nobody lives—a full-size, fully furnished bungalow built on the roof of the company's plant and used solely for engineering tests.

$12,500 Per Man

AVERAGE INVESTMENT per worker in industry is $12,500, according to MAPI. And it is obviously going up. This suggests that more care, rather than less, will be necessary in hiring and training.

Trouble Can Be Simple

FOR SIX MONTHS the job has run without a hitch—thousands of pieces machined without trouble. Then tools begin to break as fast as they are installed. The line is down. What to do? Must be the equipment. Call the manufacturer . . . get a service engineer. The loss is costing us a fortune. Meet the manufacturer's man at the plant. Rush him to the plant. Everybody waiting. Big conference. Got to straighten this thing out. Go into huddle with master mechanic, chief tool engineer, assistant chief tool engineer, methods engineer, lubrication engineer, maintenance chief, buyer, production manager, and a couple of unidentified stringers. Three and one half hours of gabbing, arguing, shouting, and guessing later, service engineer says, "I don't know what you all are getting at, so lemme see the machine, *please!*"

Even as he is walking up to the machine, he hears a groaning sound. Shut it off quick! There's the trouble. The tool hasn't been set up to the gage. It's digging into the work before it reaches cutting speed; overloading. Suddenly, everybody recognizes the difference in the sound he has been listening to for six months. Why?

Seems they replaced the toolsetter yesterday and the experienced man forgot to tell the new man about that gage—or the new man wasn't listening, what with all of the other details he had to absorb. But none of the experts imagined that it could be that simple. Because the effect was serious, the cause must be *serious* too.

Sound silly? Sure. But it actually happened and it continues to happen every day.

The Product They Gopher

GOPHERS are the scourge of the West Coast. Many a green-thumbed householder has seen his newly planted shrubs go down into the ground before his eyes—dragged in by a gopher. So 66 years ago, a barber named Zephyr A Macabee built a better gopher trap. Ever since, his family company has been making them—last year produced 230,000, over 80% of those used in the West. Twelve machines cut and form the ten pieces of wire for hand assembly, and 800,000 ft of wire are used a year, but the plant is still the original bungalow built in 1894, and there isn't even a sign. There's just "Z A Macabee" in the Los Gatos, Calif, phone book, although Zephyr died in 1940. There isn't even a classified listing—so maybe the world *will* beat a path, as Emerson said—if it's gopher traps.

Tool Show – 2

1 Ford will spend $30 million to train college undergraduates in engineering and science

2 Three more companies offer ceramic bits – some do interrupted cuts – Ford reports some production jobs better than carbides

3 Industrial diamonds – synthetic or real – may play a big future role in machining Ford has increased use 80% in 10 years, now uses $1 million worth a year

4 MIT tests ways of applying cutting fluids, favors mist

5 There is too much emphasis on heat - power, too little on social science, English and manufacturing processes in current curricula

Key Ideas at the Tool Show

Two startling points were made in post-address discussion by D J Davis, vice-president of mfg, Ford Motor Co, at a dinner sponsored by Armour Research Foundation, Industrial Diamond Assn, and the Diamond Tool Industry during Show week (Mar 20). They were:

1. Ford is planning to spend about $30 million to train college undergraduates (sophomores or juniors) from engineering or liberal-arts schools in engineering and scientific subjects at its own school in Detroit. This means a practical attack on the shortage of "institute-level" men for industry supervisory posts.

2. Ford has been testing ceramic toolbits, finds them superior to carbides in some production applications.

Mr Davis, speaking on trends in manufacturing, said Ford is now using 80% more diamonds than it was 10 years ago—just under $1 million a year—much of it in boring tools, compounds, diamond wheels for carbide-tool sharpening and pencil-edge wheels for glass.

Forward product planning has come into its own. Stylists and product personnel work closely with manufacturing engineering to head off unfeasible designs. But design and styling changes are frequent and inevitable. The bumper, for example, is functional but greatly affected by style changes. It covers so much area that systems are much larger and complex, as much as 750 ft long, completing a bumper every 3 sec, doing four acres of plating every 16 hours.

Painting also is much more complex. There are now some 80 colors, compared with the one that Ford once used. This means 80 different paint lines to a booth. 60% of production is 2-tone, and an increasing percentage 3-tone. All this complicates assembly-plant operations and inventories. Wrap-around windshields are getting bigger; power steering and braking, automatic transmissions, and like features add complication and force flexible planning.

Facilities investment at Ford is up 44% since 1950, and equipment obsolescence is about $40 million a year because of accelerating design changes in the product. Machine design is no longer providing enough flexibility. Maintenance is difficult because of complexity. One possible solution is standard elements for transfer machines, so they can be built or rearranged as needed.

Cold extrusion, cold rolling, die casting, precision casting, shell molding, powder metallurgy, Fiberglas-reinforced plastics and the like are coming along rapidly to save machining. The *Thunderbird* (60 a day) has a plastic roof, for example.

Better cleaning methods are being forced on production departments. Mr Davis suggested ultrasonics as an answer here, as well as in plating, pickling, deburring, and quenching. He also spoke of efforts to reduce noise, of isotope gaging, and of our tremendous need for production technicians even to keep up with recent developments in Russia and Germany.

MIST VS FLOOD COOLING

Definitive comparisons of mist and flood application of cutting fluids were reported by M C Shaw and P A Smith of MIT in ASTE Research Report No. 3. They found:

1. Above 200 fpm, major role of the cutting fluid is cooling. At 250 fpm, commercial water-base fluids in

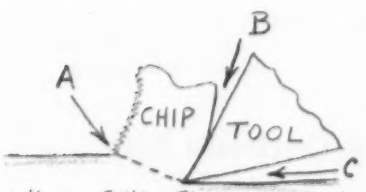
liquid form were better than water because of slight boundary lubrication. However, at 400 fpm, water was as good as any commercial fluid because cooling only is involved.

2. Metallurgical differences in various heats of steel make more difference in tool life than do the cutting fluids in turning.

3. Water-base fluids (except water itself!) as mists gave tool life as good as that for flood cooling. Water as a mist was much better (because of great evaporative cooling) but does cause rusting. A little rust inhibitor, like sodium nitrite, will give better results than oily additives that interfere with heat transfer.

4. Amount of liquid in mist is not critical; a quart an hour is enough.

5. Most effective way to apply either fluid or mist is along the clearance face, direction C (see sketch), but a high-speed machine



Where Cutting Fluid is Applied

must be covered to avoid operator splashing if fluid is used—not with mist. A mist tube on the bottom of the toolholder does it. Direction A is a compromise between performance and operator comfort. Direction B is the poorest of the lot in high-speed turning.

6. RMS values circumferentially help little in studying influence of cutting fluids on surface finish in turning. An analog tool rotated 90°, with a lead pencil wearing on the turned surface, is a useful device for comparing fluids at 100 fpm.

7. Surface roughness was at a sharp maximum at about 50 fpm—speed was far more important than any choice of the water-base fluids tested in this vicinity.

8. Mist did not give quite as good finish as flood for the best fluids, but difference was far less than that between a good and bad lubricant. Thus, if mist is more convenient at low speeds where surface finish is a major problem, little if any finish is sacrificed by using it.

9. Water is not a good material where finish is important.

10. Actually, solid cutting "fluids" are already in wide use. The so-called "free-cutting" steels incorporate sulfur, lead, selenium or graphite which spread over the chip surface to produce a low shear-strength layer. (In this connection, a direct comparison of machining leaded and carbon steels in the Ryerson booth was interesting. A ½-in. drill at 650 rpm with 5-lb feed drilled a ⅝-in. carbon-steel plate in 40 sec, a similar leaded-steel plate in 30 sec.)

Ceramics Make Tough Cuts

Two demonstations of ceramic tools drew top attention at the Tool Show. One of these seemed to indicate that many of the accepted ideas about ceramics are in error.

Three new ceramics were introduced on March 19, bringing to seven the number of companies that offer versions of the new material. The additions: Ceralox, Seramet, and Sintox. Two previously announced ceramics—Carboloy (*AM*—Nov 21 '55, p182) and Stupalox (*AM*—Dec 19 '55, p154)—were also on display. The other two brands—Norton (*AM*—Oct 24 '55, p180) and Diamonite (*AM*—Jan 30 '56, p133)—were not shown.

Ceralox OX-12 announced by Adamas Carbide Corp is the sintered aluminum oxide developed by Kearfott. It is one of the two ceramics mentioned as under development in the recent detailed report on Tomorrow's Cutting Tools (*AM*—Mar 12 '56, p153). Ceralox is available in standard sizes as triangular, square, and round throwaway bits for Adamas' standard holders.

Seramet, announced by Vascoloy-Ramet Corp, is also a sintered aluminum oxide available as triangular and square throwaway bits for V-R standard negative-rake toolholders.

Sintox, announced by Sintox Corp of America, is a fused oxide material. Although it is produced in England, it is not the same material that was tested in this country in the past and was described in the Mar 12 report as BSA-Sintox.

STARTLING DEMONSTRATIONS

One of the two demonstrations of ceramics was by Sintox. Disturbed because the Tool Show Issue of *American Machinist* reported past tests of Sintox as a failure, the company deliberately set out to do the things that experts have agreed could not be done with ceramic tools.

Two Alfred Herbert lathes (7½ and 15 hp) were used to turn SAE 1030 steel. A variety of cuts was made on round test bars in the larger lathe with depths of cut ranging up to 1/4 in. Roughing and finishing cuts were taken in that order with the same tip.

At 1/4-in. depth, feeds were from 0.006 to 0.018 ipr and speeds were varied from 50 to 1500 sfpm. At 1/8-in. depth, feeds were set at 0.077 ipr initially, but this had to be reduced to 0.040 ipr as a safety measure because there was no guard to protect visitors from flying chips. New bars were mounted off center to create difficult cutting conditions and induce chatter to demonstrate the durability of the tips.

On the smaller lathe, hexagonal bars were turned down to provide an interrupted cut. This was made with a tip molded with a deep chip groove. In this connection, company officials stated that the tips can be used in milling cutters.

Sintox is said to be fused rather than sintered oxide. It is made up predominantly of aluminum oxide of 99.5% or better purity; it includes chrome oxide and other oxides, but no binder. The chrome oxide gives the material a pink color and may be included to conceal the other oxides. (The new material is a much darker pink than the original Sintox.) The mixture is molded to shape and fused by a lengthy process at much higher temperatures than those required for sintering.

The resulting tool has a hardness that has not yet been determined, though it will cut sapphire. The transverse rupture strength is reported to be 90,000 psi.

Sintox is available in round, triangular, and square bits for special split holders. The bits are clamped on the side rather than the top and rest on a supporting screw. After the bit is clamped, the supporting screw is drawn up to place the bit in compression. Bits are normally used as throwaways, though they can be sharpened with diamond wheels and a generous supply of cutting oil. A technique for grinding with silicon carbide is under development.

The other demonstration was by the Stupakoff Div of The Carborundum Co, using the previously announced Stupalox bits. A typical

Tool Show - 3

demonstration here was on SAE 4140 alloy steel heat treated to 32 to 34 R_c. With a Lodge & Shipley 20-hp lathe, test bars were cut with a 0.150-in. depth of cut and 0.019-ipr feed at speeds ranging from 900 to 1200sfpm.

FUTURE OF CERAMICS

The current belief that cemented-oxide tools will get nowhere because of their extreme brittleness was likened by W B Kennedy, chief experimental machining branch, Rodman Laboratory, Watertown Arsenal, to the hesitancy with which the hard, brittle cast nonferrous cutting alloys of the tungsten-chromium-cobalt group were accepted early in the century, and to the similar resistance to the introduction of cemented carbide tool materials experienced during the late '20s and early '30s.

Ceramics tested during the metal-cutting tests at the Rodman Laboratory have included glass-bonded aluminum oxide, high-purity aluminum oxide, aluminum oxide with various additives, metal-bonded silicon carbides and boron carbides. Cuts taken with tools made from these ceramics showed that "only ceramics processed from aluminum-oxide compositions exhibited appreciable ability to machine steel." "It was also observed," said Mr Kennedy, "that ceramics, capable of machining steel, displayed equal or superior performance when machining cast iron or brass."

Because of current difficulties experienced when taking roughing cuts or interrupted cuts with most cemented-oxide tool materials now available, one test cut reported by Mr Kennedy is of particular interest. "The high resistance to abrasion of these ceramic tools," said Mr Kennedy, "was brought out during the machining of a 5-in.-dia low-alloy cast-iron test bar; the ceramic tool machining the abrasive scale without difficulty. Also, a sand spot approx 3/4 in. across and about 1/2 in. deep was machined off without the usual difficulties. The sand spot made no impression on the cutting edge of the tool, and there was no evidence of 'bumping' in the lathe cross slide, which often results in early tool failure."

Mr Kennedy also reported that "the ceramics were dry ground because available grinders were not equipped to supply the copious flow which, according to previous ceramic reports, is mandatory. An inadequate flow can cause intermittent heating and cooling, with possible cracking of the ceramic, because of low thermal shock resistance. Ceramic cutting tools have an excellent heat resistance, and no difficulty was encountered in grinding without coolant."

Standard 60-grit green silicon-carbide wheels initially were used for rough forming operations, according to Mr Kennedy, with similar 400-grit wheels being used for finishing. Examination of surfaces ground with these wheels, using a 10X magnifier, showed an excellent surface finish with no directional grinding lines, but some specimens exhibited networks of fine cracks, like those developed when force-grinding hardened tool steels. Also, said Mr Kennedy, "chipping of the cutting edges was difficult to avoid when grinding with silicon carbide wheels." This chipping was eliminated, and a lustrous finish was produced, by using standard diamond-impregnated wheels of 150 and 350 grit.

"The ceramics that exhibited relatively high hardness offered high resistance to grinding," according to Mr Kennedy, "but the softer types presented no problem in this respect. The feather edge prevalent after grinding was carefully removed with a diamond-impregnated hand hone of 350 grit. Experience disclosed that hand honing is necessary along the entire cutting edge, to prevent flaking by contact with the curling chip. . . . It is necessary that ceramic cutting tips be ground flat on the bottom face contacting the toolholder platform to avoid cracking when clamping pressure is applied."

In connection with the hand honing of tool cutting edges, noted above, it was of interest to find exhibited in Lovejoy Tool Co's booth at the Tool Show a pink cemented oxide hand hone they have been importing from West Germany for some time for such operations. Less expensive than diamond-impregnated hand hones, but just as effective when used for honing cemented carbide cutting tools, these stones are reported to have characteristics similar to some of the ceramics now being tested for metalcutting.

New and Throwaway Carbide Bits

Increasing popularity of throwaway carbide tips was evident by the emphasis on both bits and holders. Additional sizes and types of holders (several new designs were described in the *AM* Tool Show Issue) were introduced and complete lines of both negative- and positive-rake holders were shown. Improvements in carbides in recent years make negative rakes less necessary, and there was talk of rapid growth in the popularity of the positive-rake holders.

Progress on a new ASA standard for carbide tool tips was reported by W H Seacord of International Harvester. The new standard has been drafted and submitted for industry approval. It covers single-point carbide-tipped tools, boring tools, and carbide blanks. Throwaway blanks and holders are not included in the present version but are under study by the draft committee for a later revision.

NEW TITANIUM CARBIDES

Two high-titanium carbides were announced at the Show. Kennametal introduced Grade K7H, a bit containing more titanium carbide (though still containing some tungsten carbide) and less cobalt binder, designed for high-velocity machining at light to moderate feeds. Hardness is 83.5 R_A with a transverse rupture strength of 175,000 to 200,000 psi. This grade is recommended for high-tensile steels, 400-series stainless, and nickel-base alloys. It has cut steel at 1500 sfpm. Because it is difficult to

ASTE Honor Awards

James H Kindelberger, board chairman, North American Aviation, Inc, received the Progress Award for life-long leadership in the development of civilian and military aviation.

Orlan W Boston, professor, University of Michigan, received the Gold Medal for his work as an educator in production engineering and his advocacy of the importance of tool engineering.

Ralph E Cross, executive vice president, Cross Co, received the Engineering Citation as a pioneer and leader in the development and application of automation principles to machine tools.

Edward W Ernst, machine-tool specialist, Major Appliance Div, General Electric, received the Joseph A Siegel Memorial Award for his work for the society, including the standardization practice.

Tool Show-4

grind, K7H is available only in throwaway bits.

The other high-titanium carbide was introduced by Carboloy for steel-finishing operations. Grade 330 has a nickel binder and a transverse rupture strength of 200,000 psi. In precision cutting of hydraulic valve lifters it is said to have lasted three times as long as any carbide previously tried.

Carboloy also introduced a new cast-iron grade, 860, for milling high-strength cast irons with heavy scale and irregular surfaces. It is said to provide 20 to 30% better tool life in face milling the gray irons that have additives to produce dense structure. Recommended speeds are 250 to 300 sfpm with feeds of 0.007 to 0.012 ipt.

Tool Steels Refined

Few changes in tool or die steel compositions were in evidence. However, the many tool-steel exhibitors were all emphasizing the importance of quality and the refinements they are continuing to make in their processes. Much higher cutting efficiencies are being attained.

The need for tool-steel standards was discussed by Dr George A Roberts, vice president, Vanadium-Alloys Steel Co. He indicated the likelihood that the ASTE standards committee (which has been assigned this area by the American Standards Assn) will follow the identification system adopted by JIC, SAE, AISI, and ASM (see *AM*—Mid-Nov '54, p134, for a description of this system) though he took strong exception to the practice of setting composition ranges as in the latest SAE standard. Gradual standardization of sizes for the popular grades will also be attempted. The average warehouse stocks 400 sizes of manganese oil-hardening steel, more than 700 sizes of M2 HSS. Many of these sizes could probably be eliminated if the tool designer knew with certainty what sizes were available immediately. The committee plans study of least O1, A2, D2, H12, and M2.

Diamond Tools by the $Million$

An innovation at the 24th annual ASTE Industrial Conference was a Shaped Diamond Tool Symposium cosponsored by ASTE, Armour Research Foundation, and Industrial Diamond Assn of America. Keynote speakers at the dinner which opened this three-day series of meetings were Dr D J Rettaliata, president of Illinois Institute of Technology, and J S Gillespie, manager, Diamond Project, Carboloy Dept of General Electric Co.

During his talk, Mr Gillespie—now known as "Diamond Jim" in industrial-diamond circles—stated that industrial diamonds could easily be a $200 million business in this country within the next decade, if costs of man-made gems can be brought down below that of those now mined. "Because the nation's enormous industrial productive potential is built around their use, industrial diamonds have become of great strategic importance," he said. "Commercial diamonds, now used at the rate of 12 million carats annually, today represent a $50 million business. About 80% of these by weight go into grinding wheels, the balance into rock drills, wheel dressers, metal-cutting tools and dies for shaping metals."

As part of the shaped diamond tool program, the Industrial Diamond Association of America had on display at the Tool Show about $6 million worth of gem and industrial diamonds, a working model diamond mine, a diamond-cutting workshop and many diamond tools. Included among the gem diamonds on display were the 426-carat blue-white Winston diamond, a 315-carat yellow diamond, a 68 3/4-carat white, and the Kimberly and Transvaal diamonds. Of particular interest was a demonstration of lathe-turning brass tubes from the rough to 1 mu-in. finish with a diamond-pointed tool.

A new method for cutting, shaping, and polishing industrial diamonds by machine, instead of completely by hand, was disclosed by Dr J F H Custers, director of research, Diamond Research Laboratory, Johannesburg, SA, during the second session of the diamond symposium. This machine enables an unskilled workman to learn in 4 to 6 weeks how to cut and shape industrial diamonds. In addition, the machine is claimed to decrease the possibility of errors. "By decreasing the time required to shape industrial diamonds and the probability of error in shaping them, and by enabling the manufacturer to buy a sack of diamonds, then sort them for his various uses and cut them in his own plant, we should be able to cut the cost of diamond tools," said Dr Custers. The machine, now being made in England, is reported to cost between $4000 and $5000.

Use of diamond-pointed cutting tools for mass-production of precision parts was discussed in papers by L A Hurwitz and R A Kurtz of Hamilton Watch Co, D J Wallace of Wheel Trueing Co, and Joseph Klipper of Clipper Diamond Tool Co. They stressed the brittleness of the cutting edges of diamond tools, and stated that machines for diamond-cutting operations must be designed so fine edges of the tools are not subjected to severe shocks. The machines should be free from vibration and designed to hold the tools rigidly.

Both Mr Wallace and Mr Klipper referred to the use of diamond-pointed tools for finish-boring wrist-pin holes in diecast aluminum-alloy pistons for automotive engines, with considerable cost savings. According to Mr Klipper, carbide-tipped tools are used for rough boring and diamonds for finishing. A carbide and a diamond bit are mounted in each bar, spaced far enough apart that both tools can never be in contact with the work at the same time. Approx 0.005 in. of stock is removed by the diamond bit, with the bars turning at 8000 rpm.

When using carbide finishing bits, the machine usually must be stopped every 300 pieces for bit adjustment to compensate for edge wear, and every 2500 pieces for resharpening of the finishing bits. But average performance of the diamond finish-boring bits is close to 50,000 pistons per sharpening, and each bit can be sharpened four times. One diamond bit bored 107,000 pistons before removal for resharpening.

Total tool cost per million pistons was stated to be $572 when carbide tools are used for both roughing and finishing operations, $362.60 when diamond-pointed tools are used for finishing cuts. In addition, there is a net saving in down time for tool changes of 256.2 hr per million pistons with diamond-pointed tools.

Tool Show-5

Throwaway-Bit Milling Cutters, Other Tools

As with all previous ASTE Tool Shows, many booths were filled to overflowing with latest designs of cutting tools, tool drivers, and machine-tool attachments. But diligent search turned up only a few new developments not already reported to readers of *American Machinist*.

Of particular interest is evidence of the continued development of holders for throwaway cemented carbide and ceramic toolbits. More makers exhibited holders for single-point throwaway bits. In addition, five makers of carbide tools exhibited face-milling cutters especially designed for throwaway bits. Two of these cutters were announced some months ago—but three were entirely new at the Show.

Two of the new face-milling cutters, and one older one, have slotted bodies into which standard single-point toolholders are clamped axially around the periphery so standard lathe bits can be clamped, and indexed as they become dull, in the same manner as when the tools are used conventionally. The other two bodies are designed to clamp the indexable bits directly. One of these designs employs a novel centering gage which permits accurate location of the individual bits as they are locked in place, thus eliminating tedious checking with dial indicators and readjustment of bit locations to insure all cutting edges are on the same plane. This cutter uses square carbide bits, locating with negative axial and radial rakes, so the bits can be indexed to provide eight cutting edges before they are discarded. The other cutter of this type uses octagonal bits, permitting 16 production runs before resharpening the cutter.

Because face-milling cutters employing throwaway bits can be kept in use almost continuously, by repositioning or replacing the disposable bits as they become dull, they need not be returned to the toolroom for resharpening, and excess reserve inventory of cutter bodies usually is not necessary. In addition, the same cutter bodies often can be used for face-milling both cast iron and steel simply by interchanging bits of different carbide grades.

On exhibit for the first time was a

What's Wrong with Engineering Curricula?

Current engineering curricula place too much emphasis on subjects relating to heat and power and too little on subjects relating to design and production. This conclusion was evident from a study of graduates of five schools reported by ASTE's National Education Committee.

All graduates in mechanical and industrial engineering in 1950, '51, and '52 from Lehigh, Michigan, Purdue, Tennessee, and Texas were surveyed. These classes were chosen because enough time has elapsed for these engineers to have completed industry training programs and be fairly well established in an area of primary work interest.

Replies were received from about half of the graduates surveyed. Percentage distribution of these engineers to the various types of work are shown in the sketch. If we combine those who checked manufacturing engineering and maintenance (both involved in production), more than one out of three graduate engineers in this group are in jobs concerned with production.

At the same time, a survey was made of industrial companies to see what had happened to mechanical and industrial engineering graduates hired from the class of 1952. If we omit the men no longer with the companies (318 companies reported on 1952 engineers), the results are:

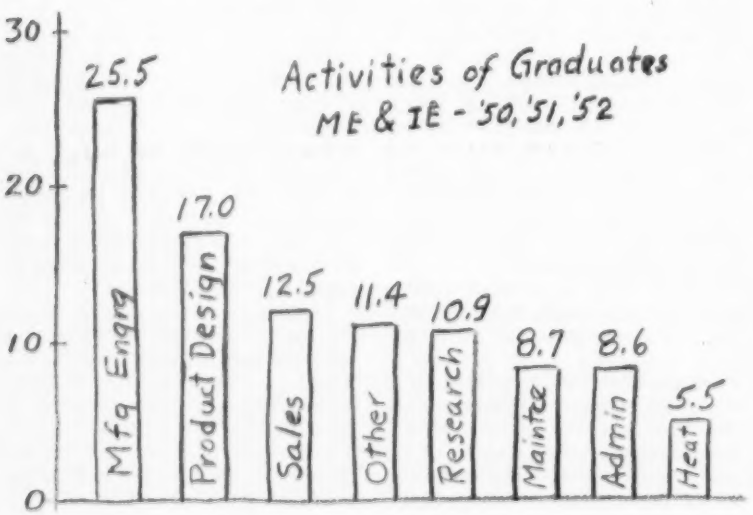
Manufacturing engineering	37.0%
Product design	33.1
Sales	14.2
Research	8.9
Other	6.8

In the school survey it was noted that there was a rather marked similarity in the distribution of activities in each of the schools. In heat-power, for example, the range was 4.3% (Purdue) to 6.6% (Texas), with the average at 5.5%.

Committee chairman Robert E McKee of Michigan reported that the results of the study were already having quite an effect on thinking at the schools participating in the survey. He said the committee did not suggest that the study be accepted as definitive, but proposed that each engineering school study the work experience of its own graduates to see how well the curriculum fitted their own requirements.

Of added interest was a question asked on the Purdue survey as to what subjects should be emphasized in the curriculum. Out of 936 replies to this question, the subjects mentioned most often were:

Social science, 180 mentions
English, 152
Manufacturing processes, 111
Mathematics, 101



Tool Show-6

novel threading toolholder for accurate single-point chasing of threads in engine lathes having spindle drives which can be reversed automatically. Usable for chasing either "V" or square threads, the holder is positioned in the toolpost, like any single-point tool, and the lathe carriage is left in engagment with the leadscrew. As the carriage automatically is traversed back and forth along the section of the workpiece where threads are to be cut, the toolbit drops into the threads when moving in the forward direction, and rides on top of them when carriage movement is reversed. Right or left hand threads can be chased with the same holder. Forward feed of the tool between cuts is accomplished manually. Precision limit switches are adjustably positioned on the lathe bed, on each side of the carriage, to reverse the spindle and leadscrew at each end of its travel. Thread-chasing time is said to be reduced 70 to 90% with this tool.

Also of interest in the threading field was a new universal pipe thread-rolling attachment for use on engine and turret lathes, vertical turret lathes, and practically all types of hand and automatic screw machines.

A new, inexpensive cartridge-type boring bit designed for micrometer adjustment also attracted much attention. These units all use carbide cutting bits, and feature positive locking, without backlash in either direction. Micrometer graduations are part of the setting-wrench assembly. In addition, a demonstration of the recently announced, two-lip gun drill for high-speed production of precision holes from the solid in cast iron, aluminum and bronze drew large crowds.

Two exhibitors showed cast and rolled aluminum and magnesium plates and bars for the construction of lightweight jigs and fixtures. Such tools have found favor in airframe plants for some time, particularly on the West Coast—but both exhibitors told *American Machinist* that metalworking plants outside the aircraft industry are starting to use their materials extensively. Of particular interest was the report by the supplier of cast aluminum-alloy plates that some of his customers are having jig and fixture parts "hard anodized" for wear resistance after these parts are machined to size. The process used is a standard, commercial anodizing procedure. This treatment has been particularly effective in eliminating galling when aluminum sheet parts must be formed on aluminum tools, as in stretch-press operations.

Press Tooling Featured

The influence of automated stamping was evident in presses and press equipment that generally emphasized automatic loading and unloading as well as cut maintenance and improved production. A high-speed, 5-ton, notching press shown by V & O Press, for example, automatically loaded lamination blanks from a keyed mandrel into an indexing fixture. Here each blank was pressed onto a plug carried by the fixture spindle and held down. At end of cycle, after 48 notches were produced around the periphery, the hold-down mechanism raised while the notched lamination was lifted from the plug and ejected onto another keyed mandrel. The notching fixture was driven from the press shaft by bevel gears and roller chain with the required intermittent motion provided by a special "rollergear" worm drive. A system of change gears determines the number of notches produced and eliminates index rings, pawls and friction drives.

In the area of press automation, a new automatic press unloader was under considerable discussion although it was not exhibited. Production stamping people at the show described the device (built by Press Automation Systems of Detroit) as a completely self-contained packaged unit ready to run when uncrated. After installation on a press, it hooks into the shop air line to power air cylinders that run the pickup arm and it operates on 110-v current. Die setting is simplified by pushbutton controls that permit single stroking and inching on manual and high speed operation on automatic. For shops not equipped with modern presses built with integral automation systems it was said that this self-contained unit is especially useful.

Uptodate clutches and brakes were shown, too—one of the most interesting being a pneumatic combination (Fawick Airflex), that simultaneously engages the clutch and releases the brake for high operating speed and greater operator safety. In case air pressure fails, the clutch disengages and the brake engages, thus automatically preventing double stroking. Another was the Press-Rite Airflex air-friction clutch equipped with a limit switch. In this one, the brake is applied by constant spring pressure and released and operated by air. Its actuation opens a valve to release air from the clutch. This interlocking of clutch and brake action prevents either from being engaged while the other is operating —and if air or electric power fails, the clutch disengages and the spring brake stops the press instantly.

CONTROL ON HYRAULIC PRESSES

Along with a number of late-model power presses (Press-Rite, Rousselle, V & O, and others), hydraulic presses pointed up current interest in fast action and better controls. A 200-ton metal-forming platen press, for example, was demonstrated by Rodgers Hydraulic, Inc, to show selector switch control and automatic operation. This press is put into automatic operation by holding two down-buttons in position. It closes at a speed of 400 ipm until an adjustable fast-travel limit switch is actuated; then, by releasing the pushbuttons, it continues to close at 90 ipm until a predetermined load (0 to 80 tons) is reached. A high-volume, low-pressure pump cuts out at this point and the press closes at 20 ipm.

For low tonnage requirements, Lempco showed a 25- and 50-ton manually operated hydraulic press. A screw-type ram extension provides an extra 6 in. of travel and quickly positions the ram on the work. Similar Lempco presses are electrically operated for straightening, assembly, light stamping, forming, and other operations.

Carbide dies were given considerable attention, too. Thomas C Roberts, president, Kobzy Tool Co, told engineers that new carbide dies can be depended upon to produce up to ten times the amount that steel dies have produced in manufacturing certain parts. In a conference co-sponsored by the National Tool & Die Mfrs Assn and headed by Willis G Erhardt, of Erhardt Tool & Machine Co, Mr Roberts pointed out that the cost of carbide dies (two and a half times that of steel dies) confined their use to such branches of industry as electric motors and automotive parts where high-volume production permits advantageous use of their long life.

Tool Show-7

Plastic Tooling Spreads

Plastic tooling was much in evidence at the show, too, with such suppliers of material as Rezolin, Ciba, Bakelite, and others exhibiting materials. Ciba and Bakelite, for example, actually built tools at their booths with epoxy compounds to demonstrate techniques employed. Tube bending dies made of plastic were given considerable attention. Complex forming in multiple planes, including short-radius bends, are possible with low-cost plastics, according to Warren Plastics & Engineering. The plastic dies can be used with any conventional stamping or forming press for either low- or high-production runs. In operation, the dies require no lubricants, and the smooth rolling action of the contours reduce abrasion and die wear. High surface finishes are produced and precision bends are made by allowing for the exact amount of springback in tube stock. A big advantage of this material for tube-bending dies is quick duplication —once designed, molded dies can be reproduced easily for high-production applications where several presses are used.

According to Fred Lyijynen, supervisor, plastics development dept, Automotive Body Div, Chrysler Corp, plastic tooling is outperforming metals in many cases. Use of plastics has more than doubled in the last two years, not only for secondary tooling such as templets, frames, jigs, and other supporting members, but also for basic tooling. Reason for the rapidly increasing use of plastics for tooling is its versatility, low cost, machinability, and the short cuts possible with it in building tools. Form and flange dies, drop-hammer dies, hydroform blocks, assembly fixtures, drill fixtures, and many others were among the plastic tools described as being used successfully in the aircraft and automotive industries.

Inspection Ideas

Surface finish received a lot of attention—not only with the inspection equipment displayed but in technical papers that pointed out the importance of controlled finishes and good inspection techniques. A paper by C H Good, production engineer, Micrometrical Mfg Co, for example, surveyed surface-finish inspection methods ranging from fingernail tests through tactual specimens, the eye, reflectivity meters, air gages, normal and taper sectioning, shadow microscopes, interference microscopes, stylus profiling and stylus-averaging equipment. Mr Good outlined comparative advantages and limitations and tabulated best applications. Of course, only rough estimates can be made by feeling a surface; production checking is best done by averaging methods; and profile and sectioning inspection are most advantageously applied to research.

Bausch & Lomb, Ercona Corp, Reliance Gage, and C E Johansson Gage Co were among exhibitors of equipment for this work. Devices shown included QA Profilometers (Micrometrical Mfg Co), that show rms or arithmetical average roughness height in microinches. The Talysurf (Engis Equipment Co) graphs the actual profile of surface irregularities through a power-traversed stylus with an electrically interlocked repeating mechanism. As a master instrument for measuring surface finish, the unit consists basically of a pickup which houses the stylus, a gearbox for moving the pickup across a surface, a stand for supporting the work and gearbox, an amplifier and a recorder. Brush Electronics exhibited the Surfindicator—a portable, completely self-contained unit that provides accurate measurement anywhere in a plant.

ELECTRONIC TESTING EMPHASIZED

Considerable attention was given electronic inspection equipment—in fact, a paper by A H Dall, director of standard machine tool engineering, Cincinnati Milling Machine Co, stated that electronic measuring instruments have enabled industry to work to millionth-of-an-inch tolerances.

A conductivity meter that employs a simple hand pickup evaluates materials — determines alloys and hardness, sorts mixed non-magnetic metals and determines uniformity of heat treat of aluminum and magnesium alloys. Known as the "Magnatest" and built by Magnaflux Corp, the device gives immediate readings of conductivity in absolute units with no variables from contact. A small coil in the detector induces eddy currents in the test material which in turn affect the impedance of the coil in proportion to conductivity.

Brush Electronics showed its "Metal Monitor," a new portable electronic instrument for checking metals without laboratory analysis. With it, ferrous and non-ferrous metals can be identified by comparative testing with known samples, and mixed metals of unknown character can be sorted into homogenous groups for further testing. It can also be used to check stock, parts in process, or finished parts for characteristics other than chemical composition. Such characteristics as hardness, heat treatment, metallurgical structure, uniformity, plating thickness and plating adhesion can be quickly determined.

Operation is based on the thermocouple effect. An electrode (with a self-heating element) is placed in contact with the metal to be tested. Voltage generated by this contact is amplified and transmitted to a meter. A reading is then compared with those obtained from known samples.

Electronic indicators, production gages, microcomparators, and other electronic measuring equipment exhibited by Cleveland Instrument, Brown & Sharpe, International Research & Development, Federal Products, and others pointed up current interest in close-tolerance measuring equipment. Of special interest was the Warner & Swasey Probograph — a gear, cam, airfoil, and thread measuring instrument that operates with an electric probe for instantaneous recording. All measurements are taken at definite points of a coordinate system and recorded on a graph by a stylus. The device consists mainly of a base unit, rotary head and tailstock, and a probing head for longitudinal, transverse, and vertical measurements.

Miniaturization of circuits and extensive use of transistors keep electronic gages compact, according to Louis O Heinold, Jr, manager of automatic gage engineering, Federal Products Corp. Mr Heinold stressed the fact that manufacturers are producing work more accurately and cutting down on scrap and rejects as the result of gages that inspect

Tool Show-8

the work, then signal another gage that controls and resets the machine.

GAGING FOR AUTOMATION

In this regard, automation has placed considerable emphasis on automatic in-process gaging. One of the most difficult problems faced recently by tool engineers has been in-process inspection of gears made on automated lines, according to T S Gates, National Broach & Machine Co, in a talk. Mr Gates described electronic sound testers that automatically reject noisy gears and pointed out that automatic gear gages now in operation on automated lines continuously check size, eccentricity, helix angle, full-tooth, and thick or thin teeth in various combinations as required. Like all other inspection devices, an automatic gear gage must be more precise than the machining operation it checks; moreover, it must indicate clearly the reason for rejection.

Air gages for automated lines were shown as size control units and as automatic inspection units (Moore Products Co). For centerless grinders, for example, a "trend" gage measures the OD of a stream of parts, gives a visual signal, and controls the grinder. At the same time, the equipment can segregate the work into desired classifications. In-process size-control gages were demonstrated for internal grinders. Here, the Moore Air Sizing Cabinet is connected to a pneumatic plug located within the workhead. The gaging plug (which may revolve with the work), reciprocates with the grinding wheel, passing through the bore and measuring the hole with every pass. A newly developed pneumatic relay permits high-speed gaging by maintaining pressure peaks.

OPTICAL AND ULTRASONIC TESTING

Optical inspection techniques were well represented by Bausch & Lomb, Engis Equipment Co, Eastman Kodak, Jones & Lamson and others. Both Eastman Kodak and J & L, for example, showed late-model comparators, while Engis Equipment Co demonstrated gear-checking techniques with an auto collimator. With this instrument, a Taylor, Taylor-Hobson Micro-Alignment telescope is employed. The device is useful for such other work as checking V-ways of machines, grinder ways, squareness of columns and other jobs. Brunson Instrument Co had a variety of optical inspection instruments at the show too, as did Farrand Optical Co, Gaertner Scientific Corp, Reliance Gage & Supply and others.

Ultrasonic testing equipment was demonstrated for a variety of purposes. Among them, checking the thickness of castings, sorting sheet stock, and finding laminar defects. An ultrasonic instrument that operates on the resonance principle (Sonizon, by Magnaflux Corp) has heavy-duty electronic components that generate a continuously varying frequency fed to a probe-held quartz crystal. Ultrasonic vibrations of the driven quartz crystal are emitted into the work by contact through an oil film for efficient coupling. Resonance varies with thickness—that vibration frequency which is resonant at the thickness of the piece reflects a load change into the instrument and is interpreted as a pip on a fluorescent line continuously sweeping the 'scope face in time with the frequency sweep of the instrument. Changeable calibrated sheets are slipped over the 'scope face for each range in use and calibration is directly in thousandths of an inch for the type of material being tested.

TOOL ROOM INSPECTION

Among the more prosaic inspection devices shown, a number of new ideas were brought out. Do-All, for example, showed a method of calibrating gage blocks in the shop. With a monochromatic light, flatness of lapped surfaces can be checked — and a clear fused quartz (lapped flat within one millionth of an inch), is used with the light as a reference plane to check gage-block flatness. The principles involved are based on interferometry, where a pattern of dark bands, or fringe lines, become visible when a lapped surface is illuminated by a monochromatic light and viewed through an optical flat. The fringe lines form a contour map which can be interpreted in terms of millionths of an inch to indicate how closely the surface of a gage block (or other surface under inspection) corresponds with a true plane.

Another development exhibited was chrome-carbide master gage blocks calibrated to plus or minus 0.0000002-in (Webber Gage Co). These gage blocks have high resistance to corrosion, good wear resistance and a coefficient of thermal expansion within the range of common toolroom work. Other gage blocks included those of C E Johansson Gage Co, Brown & Sharpe, The Van Keuren Co, A A Gage Co and others. Size Control Co showed sets of master plain ring gages for setting dial bore gages—accurate within 0.0001 in. in ranges from 0.1870 to 3.000 in. and honed to a surface finish of 4 to 6 mu in. rms.

Granite surface plates were much in evidence (Rahn, Brown & Sharpe, Bryant), as were granite parallels, straightedges, angle plates and toolmaker's flats. Big advantage of these inspection tools over conventional materials was said to be longer retention of accuracy (they can't be nicked or chipped), and they can be used close to magnetized equipment.. They are less responsive to the widest temperature ranges and they cannot rust, corrode, stain, or discolor. A Rahn calibration kit checks surface-plate accuracy without extensive calculations.

HEATING UNITS

Heating equipment, both gas and induction, is now becoming part of automated lines. Cincinnati Milling Machine showed its first induction unit, to heat-treat a turbine shaft for Buick. Lindberg also had a working induction-heating unit. Tocco showed a ball-stud annealer with rotary table of interesting design. Spring fingers at the table rim allow studs to be snapped into a socket between them, then snapped out into an ejection chute at the end of the cycle. All three units were fully automatic, as was a Flamatic gas-fired unit and a Selas gas-fired slug heater.

ASSEMBLY MACHINE

Connecting-rod assembly—rod, cap and two capscrews—is done in a 4-station rotary machine developed by Ingersoll-Rand. The rod is set on a plaque and the other parts fed and assembled automatically by air, the assembly being ejected into a tote box.

GRINDING SPINDLE

An internal grinding spindle with a speed of 200,000 rpm was shown by Columbia International. Of West German make, the spindle operates on the planetary principle. The working spindle is driven by three outside spindles that operate in bearings at speeds up to 50,000 rpm. The small working spindle is supported and driven by contact wheels on these outer shafts. The unit is driven by a flat nylon belt from a fractional-hp motor operating at 3000 to 3600 rpm.

Air Force Buying May Write Finis to

HOUSTON, TEXAS—A comprehensive program of modernizing the machine tool holdings of the Air Force, plus the long-range tool requirements for producing superior air power for America, should help take the machine tool industry out of its "vicious feast-famine cycle", Dudley C Sharp, Assistant Secretary of the Air Force for Material, told members of the National Machine Tool Builders' Association at their 54th spring meeting at the Shamrock-Hilton hotel here March 27-29.

$70 Million for Modernization

Some $70 million has initially been authorized for the modernization program, Mr Sharp revealed. First step is to strip the Air Force inventory of obsolete and worn-out tools and also to dispose of special-purpose tools peculiar to products no longer being used. This purging operation will reduce the inventory by 4000-5000 units within the next year.

Second area of modernization, Mr Sharp announced, is replacement of tools for which more advanced types exist that can yield important increases in efficiency. Spar millers, profile millers, skin millers and boring mills are among these advanced types.

New Repair-Cost Standards

The Air Force has set repair-cost standards for eliminating many older machines from the inventory, Mr Sharp said. Tools bought from 1941 to 1946 and requiring 25% or more of their acquisition value for full repair will be disposed of. The criterion for tools bought after 1946 will be a repair cost of 35% or more. However, the maximum allowable repair cost for any machine is to be $3500. On that basis, few machines will be used in further production.

Mr Sharp believes that a continuing program of the magnitude of $70 million a year will develop as the Air Force determines availability of improved types of tools. Moreover, funds for this purpose should be forthcoming, without difficulty.

Air Force's Production Equipment Inventory today consists of 145,000 units with an acquisition value of $1.2 Billion. About 100,000 units are in active use by contractors. Around 60% of the equipment is metal cutting and metal-forming machines, Mr Sharp stated. Some 2% of the tools are more than 15 years old, 38% are between 10 and 15 years, 3% are between 5 and 10 years old, 57% are less than 5 years old. Annual purchases of tools through Air Force contractors run around $200 million.

To determine the true dollar values of tool replacement, the Air Force proposes to discard standard government practice of carrying capital assets on the books at acquisition value with no depreciation allowances, Mr Sharp said. The declining balance rate of depreciation is to be used instead of the straight-line method.

The Air Force would like the aeronautical industry to undertake a modernization program for its privately-owned tools. Mr. Sharp suggested that the machine tool industry canvass the possibilities with aircraft companies.

Electronic Programming

Mr Sharp predicted that application of electronic programming and of director-control mechanisms to machine tools "may well revolutionize the future approach to airplane manufacture. It may eventually be possible to go directly from engineering drawings to finished parts without intervening patternmaking, lofting, template making and experimental machine shop work.

In attacking the problem of machine tool obsolescence, the industry must go beyond well-recognized sales techniques, get a clearer conception of its function in the national economy and then learn how to sell that function, Louis Polk, Association president and president Sheffield Corp, said. If that is done "we can pitch our entire sales approach on a much higher level."

Continuing Research Program

Mr Polk urged builders to maintain continuous programs of research and development, declaring that "unless we obsolete our own models with new and better machines, fulfilment of our economic function becomes impossible." He also recommended that builders reach broader segments of executives both in industry and in government. The president of a company must be sold the soundness of keeping equipment modern, and the controller must be sold a cost-reduction program, and the shop superintendent must be sold on the elimination of a secondary operation.

M-Day Trigger Program

"We sell machine tools," Mr Polk said, "but what people usually buy is the function performed by the machines."

The M-Day machine tool trigger program should be completed by June 30, Joseph P Crosby, Director Metalworking Equipment Division, Business and Defense Services Administration, said. The necessary finances are not as large as originally intended, hence some of the contracts may have to be reduced.

Mr Crosby expressed hope for an early agreement among government agencies on a long lead-time machine tool program. He was of the opinion that facilities lease contracts, of which 123 were written in 1951, will not be renewed unless they are in line with the original objectives of the program—"to aid national defense by increasing production of machine tools, cutting tools, industrial gages and related equipment."

A number of high-level policy-makers in Washington, Mr Crosby reported, feel that the winner of the next war may be that country which, after the opening attack, rises to its feet first and gets into industrial production. In such case, a reserve of production capacity with which to fight a standard-type war would be desirable.

Foreign Tools for Govt?

Some military departments still are of the opinion that government purchases of machine tools should be made from foreign sources, Mr Crosby declared.

The broader aspects of the machine tool industry's public relations efforts should be directed toward "thought leaders" and should be conducted on the local level, Ralph E Cross, chairman Public Relations Committee and Executive vice president Cross Co, said in a report read in his absence by William Dolle, president, Lodge & Shipley Co. The individual companies must take on the job and must use movies, speech-

Tool Builders "Feast-Famine" Cycle

making and distribution of booklets to educate key people as to what machine tools are.

Proposed standards for hydraulic metalworking presses (except gap frame types), vertical open-gap presses, compression and plunger molding presses and accumulators are in the process of adoption as an American standard and hence will be of essential service to users, Tell Berna, executive vice president NMTBA, reported.

Control Survey

He said that a survey has been made of the machine tool industry to discover what types of cards, punched tapes and films have been developed for control of machines processing airplane parts. A reduction in the variety of such control materials used on machine tools is a prime objective. Eventually the outcome may be development of preferred sizes and types of recorded information, leading to interchangeability of control material so that a tape may be sent from one airplane plant to another and perhaps be used on a different make of machine tool.

The survey was under the direction of a new Committee on Recorded Information Controls, of which Harry Ankeney, manager of research Giddings & Lewis Machine Tool Co, is chairman. The committee is working with the Radio Electronic & Television Manufacturers' Association.

With the virtual demise of the Vance Plan, there is a clear need for each of the armed services to earmark adequate funds in the budget for machine tool procurement, with an emphasis on follow-through to insure appropriation of the necessary money. Graham E Marx, chairman Government Relations Committee and executive vice president G A Gray Co, stated. "Of all services branches, the Navy and its Bureau of Ships in particular has emerged with the clearest understanding of the need for such an indispensable program," he said. The machine tool industry would do well to cooperate with the Navy to encourage growth of its well-considered planning throughout all branches of the Defense Department.

Mr Marx said that the government should provide for modernization and replacement of its metalworking equipment on a systematic and realistic basis similar to the practice of private industry. But the task would be enormous. Pentagon owns 280,000 machine tools of which over 217,000 costing $2.9 billion are in production lines. On the basis of a 20-year life (stretching the span of usefulness to the breaking point), Defense Department would have to spend $146 million a year on modernization alone.

Regardless of the type of any future war, machine tools will play a vital part in the overall ultimate effort, Mr Marx stressed, "It does not take a seasoned swami to divine that critical machine tools will be critically critical should another mobilization occur."

NMTBA has submitted recommendations to Washington for further liberalization of depreciation allowances, Mr Marx said. Such action, if sanctioned by government and practiced by enlightened management, almost certainly would result in the purchase of large numbers of machine tools.

Mr Marx warned against drawing erroneous conclusions from overall statistics about the machine tool industry. They do not reflect the condition of individual companies and fail to account for the much higher break-even point of the industry due in part to the appreciably smaller intrinsic value of the dollar and the considerably expanded physical plants of the industry. More than that, "A machine tool sales dollar minted in 1956 includes a much higher element of what amounts to subcontract costs for the tool builder himself."

The problem of export sales confronting the industry, Mr Marx reported, can be remedied only gradually, especially in view of the one-world philosophy pervading the thinking of the State Department. He expressed the opinion that "we need not currently fear the purchase by our government at home of foreign machine tools."

It is time that machine tool builders take a new look at job requirements and gear their training programs accordingly, Urwin Rowntree, member of NMTBA training committee and director of education Brown & Sharpe Mfg Co, said. Perhaps the word "apprenticeship" should be abandoned, "for we train now for a variety of jobs." He also suggested that it might be well to depart from rigid and inflexible thinking in training programs.

Every builder must become "people-minded," Mr Rountree stated. "The manner in which a company handles its payroll investment will determine its ability to make a profit." Human engineering is as important as any other kind of engineering.

Mr Rountree raised the question as to whether all apprentices should be required to put in the same amount of time on each type of machine in the shop (such as 20 weeks on lathes and six weeks on drilling machines). Perhaps the idea that a learner is "serving his time" should be pushed aside in favor of adapting training to the individual capacities and aptitudes of each learner. He asked: Is the all-round craftsman being replaced by the highly-trained technician?

New Approach to Training

The NMTBA training committee makes these suggestions: 1) Standard four-year machinist apprenticeship does not lead to toolmaking but to supervisors, salesmen, demonstrators and engineers; 2) training programs must be tailored to the individual and not be of standard length; 3) there is a trend toward a shortened program for general mechanics; 4) establish basic minimum requirements for machine and bench work and do away with "time-serving;" 5) sharpen up selection techniques to choose the type of man needed by the type of job; 6) reappraise related classroom training and eliminate what is merely "nice to know" in favor of what is necessary and important; 7) assign graduate apprentices to challenging work ("how many new journeymen do you lose because of work assignments too simple and irksome?); 8) put more emphasis on off-shift employee development in the plant; 9) pay more attention to development of "applied imagination" techniques, such as "brainstorming."

Formula Wanted: When and How Do You

DETROIT — If metalworking companies are to replace old machines with new on an intelligent basis, they must have some sort of measure for deciding when and where and what and how replacement of individual machines should be made. Moreover, some kind of formula using simple artithmetic is of help in pulling together the facts upon which sound replacement decision can be made.

It is necessary for metalworking firms to keep their shops modern if they are to stay competitive in production costs and in the quality of their products. For this reason, money earmarked for modernization should not be diverted to other purposes.

A growing movement is on among tool users to plan expenditures for replacement over a period of years rather than months. What's more, an increasing number of companies not only are spending money for replacement on a regularized basis year by year, but also are investing funds in educating their own people how to make production equipment replacement decisions intelligently.

AMTDA Stresses Replacement

These were some of the points stressed in a panel discussion on "Selling the Replacement Market" at the 32nd spring meeting of the American Machine Tool Distributors' Association at the Hotel Statler March 19-20. Creative selling was the theme of the two-day sessions at which association president Henry R. Hanson, vice president William K Stamets Co, presided.

Thorough Selling Methods

Among other points brought out by the panel were these: 1) Replacement selling does not begin with the order and end with delivery of the machine; it starts much farther back and should carry beyond actual delivery to proper performance and maintenance; 2) interest of machine tool salesmen in replacement will be in direct ratio to the interest shown by their sales managers; 3) if the machine tool industry could double the percentage of replacement to total business, it would go a long way toward stabilizing its own production, employment and profits.

Members of the panel were: C A Woodley, manufacturing vice president Caterpillar Tractor Co; Jerome A Raterman, president Monarch Machine Tool Co; and Donald M Pattison, vice president Motch & Merryweather Machine Co. Burnham Finney, editor *American Machinist*, was moderator.

Machines in use provide a much more quickly available reserve than machines in dead storage, in the Defense Department's opinion, Raymond A Vidinghoff, chairman government relations committee and president Machinery Associates Inc, reported. Complicated skin millers and spiral millers bought by the Air Force should be put to use right away to work out any possible "bugs."

$100 Million on Standby

Pentagon has asked Congress to hold the $100 million unused for machine tools in fiscal 1956 as an emergency fund in fiscal 1957 to help break production bottlenecks such as the J-65 "crash" program and possibly to help finance facilities in the guided missiles field, Mr Vidinghoff said. He endorsed the plan for having each one of the three armed services provide for their own machine tool reserve and its maintenance.

A survey of some 75 government-owned facilities is being made by the Defense Department, Mr Vidinghoff declared. Its purpose is to determine their readiness for an emergency, the efficiency of their maintenance programs, their general management rating, and replacement and modernization programs. Pentagon has held non-defense leasing of machine tools to a minimum and has authorized it only under unusual circumstances. At the same time, more realistic rental rates competitive with commercial practice are in the making.

Mr Vidinghoff accused Air Force contracting officers of exerting tremendous pressure on machine tool builders to eliminate entirely, or reduce substantially, sales expense in recent negotiated bids for elephant machine tools. These officers had the right to try to get the best possible prices, but, he contended, they went much further by asking for a cost analysis of the items that made up the total prices.

It is an unfortunate fact, he asserted, that the distributor-manufacturer relationship is misunderstood in government circles. It poses a never-ending educational job that distributors must do in Washington. "Whether a builder sells through a distributor or through his own direct offices," Mr Vidinghoff bluntly said, "his sales costs are always about the same."

The Urge to Merge

The association has recently received assurances from the Air Force that it has no desire to disrupt established distributor-manufacturer relationships. Moreover, it recognizes selling costs as an essential part of doing business.

The urge to merge is one of the biggest menaces facing machine tool distributors, Joel Barlow, Covington and Burling, Washington, said. Some people are predicting that the time is coming when there will be perhaps only 100 machine tool builders instead of 300. He declared that representatives of the aviation and automobile industries have been preaching in Washington the purchase of machine tools by Pentagon for immediate use rather than for storage. This was one of the main reasons for the virtual scuttling of the Vance Plan. Recent Congressional hearings brought out criticism of the aviation industry for failing to spend its own money for new equipment instead of relying upon Washington for the financing.

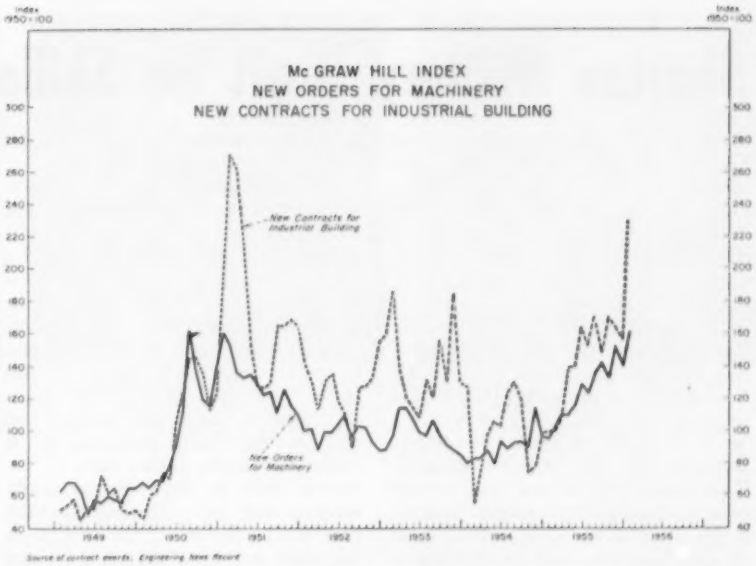
"A Big 10 Years" Ahead

Both the machine tool industry and the automobile industry can look with confidence to a big 10 years ahead. Ray H Sullivan, vice president Ford Motor Co, predicted. He made the point that a machine tool not in use is no good to anybody. He expressed the belief that machine tool builders should have a prime interest in out-dating all current manufacturing processes and machines.

Most customers buy machine tools for what they will do and not because they know every detail of the inner construction of the machines,

Replace Tools?

Louis Polk, president National Machine Tool Builders' Association and president Sheffield Corp, told association members. Salesmanship, he said, involves a score of highly professional skills—research, analysis, promotion, public relations. He declared his conviction that an increasing awareness of the importance of productivity is spreading through the nation's manufacturing plants. Mr Polk said that the machine industry owes a great debt to the automobile industry for helping to set the pace of industrial progress. That pace, he observed, has served industry in all areas and, as industry decentralizes is more and more the pattern for machine tool users wherever they may be.



HEALTHY UPTREND IN NEW ORDERS FOR MACHINERY (except electrical) continued in February on the McGraw-Hill Index. Machinery orders increased almost 19% during the month. New contracts for industrial building shot up some 70 Index points in the January-February period

ODM Sets Up M-Day Tool Pool

WASHINGTON—Office of Defense Mobilization has set up an "M-Day Máchine-Tool Pool-Order Program" to speed up production of machine tools in case of war. Here's how it works: machine tool builders will be given orders shortly for large quantities of general-purpose equipment which would be quickly needed in a future emergency. The contracts will allow the builders to work up bills of materials, facility needs, and sub-contracts in advance.

Production Would Start M-Day

Actual production of the tools, however, would not start until official declaration of all-out mobilization. At that time, the contracts would become effective; builders who can prove financial responsibility would get working capital advances up to 30% of the value of their orders.

ODM has set up a fund of $21 million from the Defense Production Act Borrowing Authority, from which cash advances would be made. The pool-order contracts will be handled by General Services Administration. Contracts will be awarded as soon as BSDA sets up authorized tool lists.

A similar program was operated during the Korean mobilization—the builders getting the green light from the government to produce specific machine tools before getting firm orders from arms producers. In case the builders were unable to sell the machines later on, the government took delivery of the equipment. Right now, the government has title to 578 machine tools worth $7.6 million. These have not been sold. The total program covered 87,000 tools worth $1.2 billion.

BSDA recently told a Congressional committee that the Korean pool-order program "failed to achieve the initial and short-term objectives of immediately accelerating and expanding industrial capacity to produce." It estimated that the Korean military buildup was delayed 12 to 18 months because of machine tool bottlenecks.

Presumably the new program takes care of all or at least most of these defects which BSDA noted in the old system: the contracts weren't "sufficiently definitive to allow a builder to carry out his production schedule on receipt of a 'go-ahead' signal from the government"; firm pricing schedules were missing in the contracts; no method was set up under which funds "would be appropriated and on hand to finish the pool-order program on M-Day."

No Set Prices Yet

The price provision in machine tool pool order contracts is still not officially set. But it's almost certain that the pricing procedure will run like this:

- The contracts will list prices prevailing as of date of execution. Then, every six months or so, the price schedules will be reviewed, and contracts will be amended to reflect changes the builders may have made in their prices. The price prevailing in the latest amendment to the contract will be the official price when and if the contract is activated during a national emergency.
- Before anything else happens on the pool order program, BDSA's Machine Tool Manufactures Industry Advisory Committee will get another chance to review the proposed contracts and the list of tools to be included.

GSA expects to sign about 125 contracts under the new program. That's just about the number made under the Korean pool order program.

Shorten Military Draft for Skilled Men

WASHINGTON—Metalworking trades and professions rank high among critical occupations which now rate special preference in the new Military Reserve Program. Under recently-issued government regulations, men with certain metalworking skills can:

- Discharge their military obligations by enlisting in the Armed Services for only six months active duty. Under regular induction they would be subject to two years' service.
- Be transferred from the Ready Reserve into the Standby Reserve. This means they do not have to take part in compulsory reserve training drills after completing active duty. In addition, they will be less likely to be recalled to service during the initial stage of mobilization.

Purpose of the special six-month training program is to allow young men with scarce skills to get their military obligation out of the way in a hurry, to make the least impact on their own careers and on the essential industries which employ them.

These are the metalworking trades and professions which qualify; engineers, die setters, jig-and-templet makers, patternmakers, and tool and die designers and makers. They must be employed in a defense-related industry — aircraft production, ordnance and guided missile operations, top-priority research and development work, and the like.

On Ready Reserve transfers, the metalworking job listing is much broader. In addition to the skills listed above, these occupations are eligible to be screened into the standby reserve and be exempted from compulsory reserve training drills:

- Aircraft and engine mechanics, blacksmiths and hammersmiths, boilermakers, coremakers, die setters, engineering design draftsmen, instrument repairmen, marine layout men, loftsmen, machinists, industrial maintenance mechanics, metal spinners, millwrights, model makers, molders, rolling-mill operators, sawsmiths, sheetmetal workers, shipfitters.
- The special six-month trainees are almost certain to be put in the Standby Reserve right after their active service — assuming they go back to work in defense-related industries. But normally employment in defense industries will not be a factor in screening men with critical skills out of the Ready Reserve.

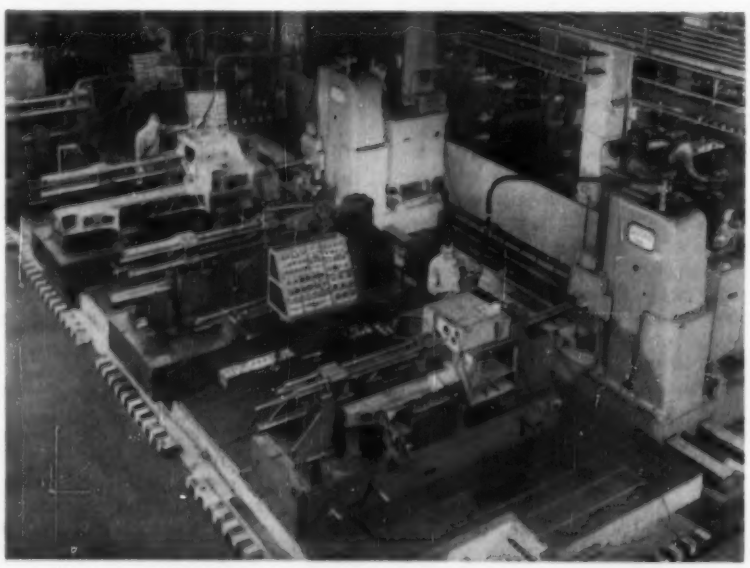
The idea behind this program is to screen out of the Ready Reserve men who would likely qualify for essential job deferments in case of a future emergency, thus have on hand a reserve force which could be quickly mobilized for active service.

There's one hitch in this program, however. Only ready reservists with skills considered in excess of military reserve needs will be screened out. A machinist assigned to a reserve ordnance repair unit, for instance, may be kept in the ready reserve and be compelled to take part in regular drills. So would an engineer, say, who has been trained to be a jet aircraft pilot.

A system of priorities is being set up to govern the transfer of men with critical occupations from the Ready to the Standby Reserve. The Defense Dept will give preference to combat veterans and to men with the least remaining obligated service in the Ready Reserve.

Pneumatic Saw

PLASTIC TOOLS, formerly trimmed by band saw, hack saw, or drill motion jig saw adaptor at Convair San Diego, now are trimmed 12 times faster and at an annual savings of $10,000 by this pneumatic jig saw



Boring Mill Cuts Bed Machining Time

TWIN-COLUMN FLOOR-TYPE HORIZONTAL BORING MILL, built by Lucas for Warner & Swasey, cuts fixture setup time 50 to 60 hours a month in machining of turret lathe bed castings. W & S works engineer George Kluter conceived its outstanding principle — taking the machine spindle to the work, rather than vice versa as in conventional boring mills. Fixtures for each of the beds machined here are permanently mounted on individual floor-level, cast iron stationary tables. Two 40-ft rails allow mill's twin columns to be moved individually from one fixture to another. Motions are pushbutton controlled

Herbert L Tigges, executive vice president of Baker Brothers, Inc, has retired to enter business for himself as consultant on machine tools (see below)

Edward W Miller (left), president and general manager of Fellows Gear Shaper Co, will continue to serve as president; his duties as general manager will be taken over by **Edwin R Fellows II,** who has also been elected vice president

Names in the News . . .

H L Tigges (above), associated with Baker Brothers, Inc, for the past 40 years in engineering, sales, and executive capacities, will continue to serve the company in an advisory capacity. Mr Tigges is a past president of both the National Machine Tool Builders' Association, and the American Society of Tool Engineers. During 1948 and 1949 he served part time as advisor and consultant to the National Security Resources Board; during the Korean War he acted first as advisor to the National Production Authority in Washington and then as director of NPA's Metal Working Equipment Division.

H J McGinn, president of Eaton Manufacturing Co, Cleveland, has been named board chairman to succeed **Clarence I Ochs,** who has retired. Mr McGinn will continue to serve as president. **H S Ide, Jr,** vice president and treasurer, has been elected administrative vice president and treasurer.

Stephen L Ingersoll, executive vice president of Borg-Warner Corp's Ingersoll Steel Division, has been elected president and general manager of the division; he succeeds **H G Ingersoll,** who has retired from that post but will continue as a vice president and director of Borg-Warner.

Vaughn E Hayes, chief tool engineer for Chrysler Corp's De Soto Division, has been appointed master mechanic of the division. He replaces **W B Shimer,** promoted to the new post of chief industrial engineer.

W R Morgan has been named vice president of Abrasive & Metal Products Co, and general manager of operations of Sterling Grinding Wheel Co, Tiffin, Ohio, subsidiary. **W H Fellows,** also named a vice president, will continue to direct sales of Sterling Co, and the Peninsular Grinding Wheel Division, Detroit. **L B Bellamy,** formerly general manager of operations for Sterling, has been promoted to vice president of manufacturing operations of the company's subsidiaries, including the recently acquired Sta-Warm Electric Co, Ravenna, Ohio.

James M Phillips, chief engineer of Salem-Brosius, Inc, Pittsburgh, has been appointed vice president, engineering.

Ray W Heiden, long active in manufacturing management at Progressive Welder Sales Co, Detroit, has been appointed director of manufacturing. **Ronald L Loup,** chief engineer of the welding machine division, has been promoted to director of engineering for all divisions.

Charles F Trapp, Jr, sales manager of Formsprag Co, Van Dyke, Mich, clutch manufacturer, has been elected vice president, sales. **L T Szady,** chief engineer, has been appointed vice president, engineering.

Harley Erickson, formerly general foreman of production for the Lincoln Electric Co, has been appointed production manager of Eutectic Welding Alloys Corp, Flushing, NY.

Charles T Bush, chief executive officer of the Charles A Strelinger Co, Detroit machinery, tool, and shop supply concern, has been named, in addition, chairman of the board. Other officers: **V Lee Edwards,** president; **A Stansell T Bush,** and **John N Failing,** vice presidents.

Park Q Wray, Jr, general sales manager for National Motor Bearing Co, Redwood City, Calif, has been appointed vice president, sales.

A C McDaniel, president of the Hill Acme Co, Cleveland tool firm, has been named chairman of the board to succeed **Ralph Perkins,** who remains as a director. **Jacob Perkins** has been named new president, and **H W Sullivan,** vice president.

Edward S Reddig, formerly executive vice president of White Motor Co, has been elected president of White Sewing Machine Corp, Cleveland. **G Glenn Nuss,** formerly president of White Sewing, has been named executive vice president with operational responsibility for the firm's sewing machine division.

OBITUARY

Alonzo G Decker, 72, board chairman, president, and one of the founders of Black & Decker Manufacturing Co, Towson, Md, manufacturer of portable electric tools, died in Baltimore March 18. Mr Decker had been president of the firm since the death of the co-founder, S Duncan Black in 1951; he had served as vice president and general manager since the company was founded in 1910.

THIS PROPOSAL CAN SAVE *YOU* REAL *MONEY*

Reports on capital investment savings on the purchase of Portage 4" spindle Horizontal Boring, Drilling and Milling Machines have been as much as 20%. In addition, the initial saving is only part of the story. When you consider operating expense vs. capital investment . . actual dollars saved are even greater than the initial 20%.

It will pay *you*..in more ways than one..to get a proposal from Portage before making a final buying decision.

Write for the Portage No. 4 catalog.

THE Portage MACHINE CO.

1026 Sweitzer Avenue • Akron 11, Ohio

Representatives in Principal Cities

BUILDERS OF PRECISION MACHINE TOOLS, SPECIAL AND PRODUCTION MACHINERY SINCE 1916

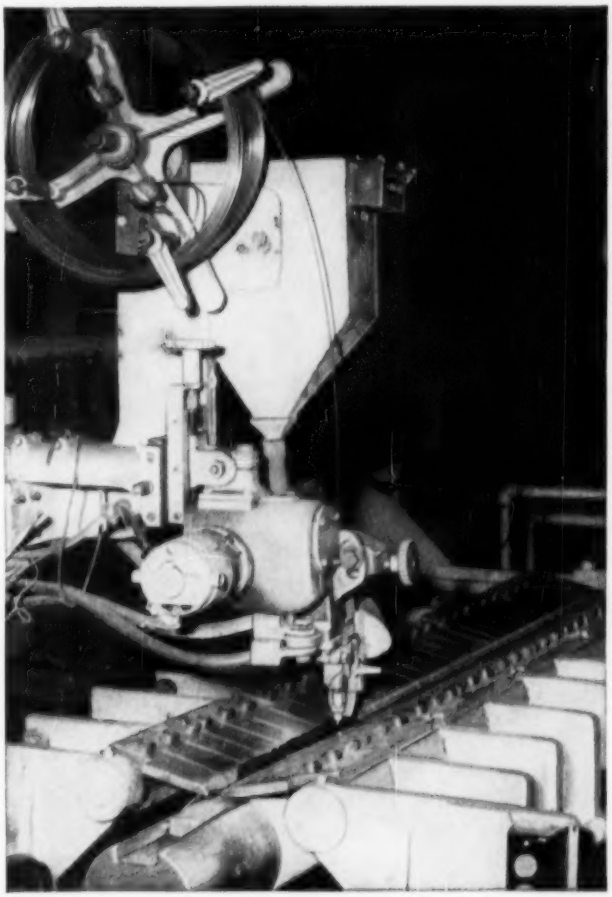
CUT *maintenance costs on tough welding jobs*

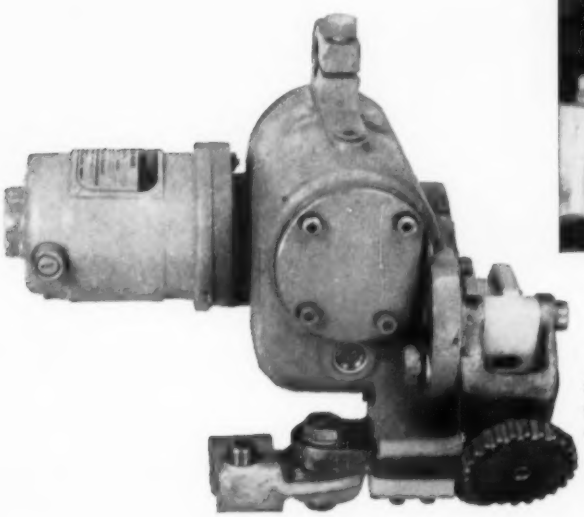
with the New UNIONMELT DSH *welding head*

Trade-Mark

Here's the low cost, submerged melt welding head that saves maintenance costs on tough welding operations. The new UNIONMELT DSH head combines the flexibility of the lighter units with the ruggedness needed in heavy-duty welding machines. Large, sturdy gears and bearings give long, trouble-free service though work may involve frequent starts and stops and feeding heavy electrode wire. Simple controls and mounting arrangements make the DSH head easy to operate and maintain.

UNIONMELT welding joins thin metals at speeds up to 200 in. per minute or makes one-pass welds with a 3-inch penetration if desired. If you have a production job in your plant that requires high-quality welds made at high speeds, ask your nearest LINDE Office today for more information about UNIONMELT welding. A LINDE Engineer will be glad to help you plan your UNIONMELT installation for high-speed, production welding.





With the new UNIONMELT DSH head now available in five output speeds, you can select the best unit you need for making high-quality low-cost welds at the highest welding speeds.

Linde Air Products Company

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.

Offices in Other Principal Cities

In Canada: LINDE AIR PRODUCTS COMPANY

Division of Union Carbide Canada Limited, Toronto

(formerly Dominion Oxygen Company)

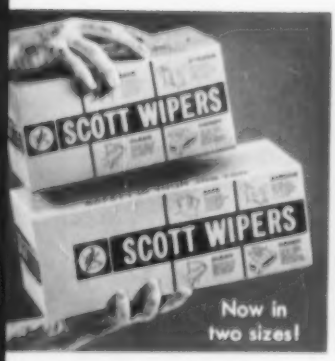
The terms "Linde" and "Unionmelt" are registered trade-marks of Union Carbide and Carbon Corporation.

Linde

Trade-Mark

It's not always possible to launder all the chips or filings out of ordinary wiping material. Chips come back to scar men and metal, to plague your production line. This man has already had four wiper cuts.

He had 4 wiper cuts last month



They're easy to distribute . . .

They really soak up oil . . .

Always a clean one handy . . .

Just toss 'em in the trash . . .

Chips can't hide in a clean Scott Wiper. Each Wiper is brand new, fresh from the carton. A man takes a Scott Wiper as he needs it . . . uses it for his face, his hands, his product.

...He had none!

The difference is . . . Scott Wipers

This is sanitary wiping. A man uses a Scott Wiper thoroughly, throws it away—takes a new one. No danger of cuts from hidden chips . . . no fear of skin infection from dirty wipers . . . when you take a fresh wiper from the carton.

And because Scott Wipers are disposable you save in many other ways. Sorting and baling are eliminated. Handling and distribution are simplified. Laundering becomes a thing of the past.

Put the Scott Wiper through its paces on your production line. Your local Scott representative or distributor is ready to demonstrate in your plant any time you say. Call him or mail this coupon right away.

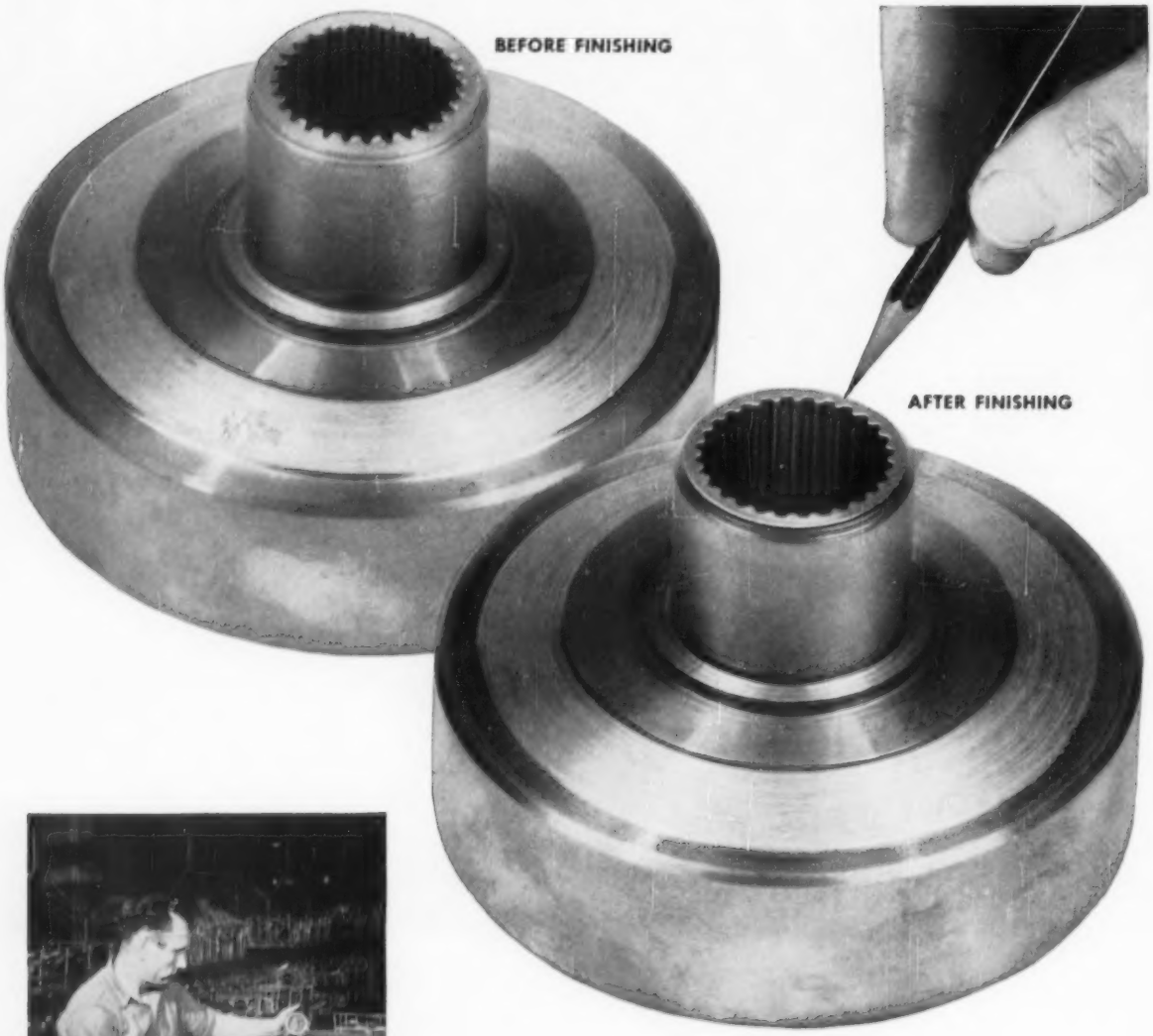
SCOTT PAPER COMPANY
Dept. W-2, Chester, Pa.
Please send me more information about Scott "Throw Away" Wipers.

Name_____

Company_____

Position_____

Address_____



Osborn Brushamatic 3A removes burrs, blends and finishes surface junctures on end of spline in continuous run of 2000-2400 of these gears per day.*

5-second finish for gears

IN a major automotive plant, 5-second Brushamatic* finishing of this gear helps maintain a high daily production rate of 2000 top-quality automatic transmissions.

An **O**sborn **B**rushing **A**nalysis of your finishing operations will show how *you* can profit from Brushamatic finishing methods proved in automotive and other industries. Write *The Osborn Manufacturing Company, Dept. C-44, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

*Trade-Mark

Osborn Brushes

OSBORN

BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES
BRUSHING MACHINES • FOUNDRY MOLDING MACHINES

FYI
FOR YOUR INFORMATION

FREE Catalogs, Booklets, Charts, Calculators

FYI – these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 PRODUCTION LATHE—*Sundstrand Machine Tool Co, Rockford, Ill.* 6-page illustrated bulletin 14-1 describes Model 14 multi-cycle single point unit with automatic cycle for roughing and finishing with separate tools. One automatic cycle will incorporate three cuts on eight diameters at four different speeds. Bulletin 14P-1 deals with application of a punch card control system on this lathe.

2 PRESS BRAKES—*Service Machine Co, Elizabeth, NJ.* 8-page bulletin illustrates and describes Semco all-steel press brakes and forged steel press brake dies. Features, specifications, extra equipment covered.

3 HAND-FEED THREAD ROLLING MACHINES — *Waterbury Farrel Foundry & Machine Co, Waterbury, Conn.* 12-page booklet 931-A-2 gives details on complete line. Units are reciprocating type, designed to roll greater lengths of threads than can be done on automatic machines. Operational features, capacity and drive arrangements, specifications for four types of machines included.

4 AUTOMATIC THREADING, CHUCKING MACHINES — *James Coulter Machine Co, Bridgeport 5, Conn.* 4-page illustrated catalog lists advantages of the H1 hob threading machine; the L1 automatic threading lathe; Threadmaster thread milling machine; and T5 single spindle chucking machine. Variety of tooling arrangements pictured and described.

5 DIE-CASTING MACHINE — *Cleveland Automatic Machine Co, Cincinnati 12, Ohio.* 8-page bulletin presents illustrated data on Model 400-N universal high-pressure hydraulic unit for zinc, lead, and tin alloys. Detailed specifications and features covered for unit which can be furnished as either a cold or hot chamber machine.

6 TOOL SHARPENER—*Firth Sterling Inc, Pittsburgh 30, Penna.* 4-page bulletin contains illustrated information on Method X sharpener. Advantages described; specifications and case histories included.

TOOLS AND ACCESSORIES

7 TOOLS — *Chicago-Latrobe, Chicago 10, Ill.* Condensed 52-page catalog 55 illustrates and describes complete line of drills, reamers, counterbores, countersinks, and special tools. Prices, dimensions, and technical data on units made of high speed carbon steel and carbide.

8 CARBOLOY CEMENTED CARBIDES—*Carboloy Dept, General Electric Co, Detroit 32, Mich.* 66-page illustrated catalog GT-310 contains data on most effective cutting speeds for carbide tools, machine tool hp requirements, how to determine shank size of single-point tools, carbide tool geometries, grade selection. Price and specification information on standard brazed carbide tools, toolholders, throw-away inserts, blanks, etc.

● GAGES—*Dearborn Gage Co, 22035 Beech St, Dearborn, Mich.* 48-page illustrated catalog contains specifications and prices on entire line of quality controlled gages produced to AGD Standards. Standard and non-standard units described; technical data section provides gaging data such as wear allowance and gagemakers' tolerance charts, ordnance tolerance tables, and a resume of gages and gaging practices. Request direct on company letterhead.

9 TAP CATALOG & GUIDE—*The Wood & Spencer Co, Cleveland 5, Ohio.* 25-page catalog 8 contains illustrated information on complete line. Tables and data on standard system for tap marking; major and PD tolerances available in standard machine screw taps; tap recommendations for Classes 2, 3, 2B and 3B Unified and American Screw Threads; major and PD for special taps; constants for finding PD and root diameter of screw threads; recommended tap drill sizes.

10 CUTTING TOOLS—*M A Ford Mfg Co, Davenport, Iowa.* 12-page catalog 601 illustrates and describes line including 11 new end mills ground from the solid, as well as new Unifiute carbide countersink. Includes sections on HSS and carbide rotary files and cutters, countersinks, carbide end mills, and special tools; dimensions, angles, and operating data included.

11 PRECISION LATHE FIXTURE — *Universal Vise & Tool Co, Parma, Mich.* 4-page catalog LF56 describes universal adjustable unit. Typical applications illustrated for use on engine and turret lathes, grinders, and Borematics to perform machining operations on parts difficult to chuck. Includes prices and specifications.

12 LUBRICANT — *Protecto-Lube Co, Detroit 11, Mich.* 6-page pamphlet gives data on Primaleen all-purpose lubri-

Name .....
Title .....
Company .....
Co. Address .....
.....

FILL IN BELOW NUMBER OF ONE CATALOG WANTED

AMERICAN MACHINIST, 4-9-56 *Not good after June 9, 1956*

Name .....
Title .....
Company .....
Co. Address .....
.....

FILL IN BELOW NUMBER OF ONE CATALOG WANTED

AMERICAN MACHINIST, 4-9-56 *Not good after June 9, 1956*

Name .....
Title .....
Company .....
Co. Address .....
.....

FILL IN BELOW NUMBER OF ONE CATALOG WANTED

AMERICAN MACHINIST, 4-9-56 *Not good after June 9, 1956*

Name .....
Title .....
Company .....
Co. Address .....
.....

FILL IN BELOW NUMBER OF ONE CATALOG WANTED

AMERICAN MACHINIST, 4-9-56 *Not good after June 9, 1956*

Name .....
Title .....
Company .....
Co. Address .....
.....

FILL IN BELOW NUMBER OF ONE CATALOG WANTED

AMERICAN MACHINIST, 4-9-56 *Not good after June 9, 1956*

Name .....
Title .....
Company .....
Co. Address .....
.....

FILL IN BELOW NUMBER OF ONE CATALOG WANTED

AMERICAN MACHINIST, 4-9-56 *Not good after June 9, 1956*

Name .....
Title .....
Company .....
Co. Address .....
.....

FILL IN BELOW NUMBER OF ONE CATALOG WANTED

AMERICAN MACHINIST, 4-9-56 *Not good after June 9, 1956*

Name .....
Title .....
Company .....
Co. Address .....
.....

FILL IN BELOW NUMBER OF ONE CATALOG WANTED

AMERICAN MACHINIST, 4-9-56 *Not good after June 9, 1956*

Reader Service Department
American Machinist
330 W. 42nd St.
New York 36, N. Y.

Place 3¢ Stamp Here

Reader Service Department
American Machinist
330 W. 42nd St.
New York 36, N. Y.

Place 3¢ Stamp Here

FYI
FOR YOUR INFORMATION

cant which resists water, chemical vapors, and temperature changes. Protects against rust resulting from use of soluble oils. Said to be impervious to flaking or crystallization at −30; 355 F open cup flash point.

13 CEMENTED CARBIDE BLANKS—*Firth-Loach Metals, McKeesport, Penna.* 18-page illustrated catalog describes Firiomet line; covers all styles of standard blanks, rectangular strips, pulley grooving and stone chisel blanks, and blanks for reamers, lathes, boring tools, roll turning and milling cutter blanks. Special blanks and inserts pictured. Grade selection chart and prices included.

HEAT-TREATING AND WELDING

14 AUTOMATIC WELDING MACHINES—*Morton Manufacturing Co, Muskegon Heights, Mich.* 8-page bulletin 56 contains illustrated information on heavy duty column-type unit; contour welders; seam welders; girth welders; and special-application machines.

15 AIR-OPERATED SEAM WELDER—*Sciaky Bros, Chicago, Ill.* 6-page illustrated bulletin 316-7 describes Type MP 1 press-type, single-phase unit. Includes dimensional drawings, tabular data on KVA range, throat depths, capacities.

PLANT SERVICE EQUIPMENT

16 INDUSTRIAL TRUCKS—*Automatic Transportation Co, Chicago 20, Ill.* 16-page illustrated catalog covers line of electrically driven trucks ranging from operator-led Transporters to Giant Skylift fork and ram units for lifting loads up to 100,000 lb. Specifications given, as well as aisle width and turning radius required by each.

17 DUST COLLECTORS—*Torit Mfg Co, St Paul 3, Minn.* 16-page catalog gives data on complete line of cabinet cloth filter and cyclone separator type units. Operating and construction features, specifications, selection information; installations illustrated.

18 "FUNDAMENTALS OF CONTROLLED VOLUME PUMPING"—*Milton Roy Co, Philadelphia 18, Penna.* Technical Paper 65 describes how controlled volume pumps, because of high volumetric efficiency and accuracy, are used as flow control instruments in both open and closed loop instrumentation systems. Typical systems illustrated.

19 GUIDE TO MACHINERY MOUNTING, VIBRATION & NOISE CONTROL—*Korfund Co, Long Island City 1, NY.* Illustrated bulletin K6A discusses machine mobility, elimination of floor bolts, leveling machines, eliminating rejects. Case histories outline solution of problems by use of isolation media such as steel springs, cork, and rubber.

20 MATERIALS HANDLING EQUIPMENT — *Lewis-Shepard Products, Watertown, Mass.* 16-page illustrated Lever booklet features material on narrow aisle trucks, walkie trucks, dragline installations, and coil lifters.

21 MOBILE STORAGE — *Delin Metal Products, Mobile Storage Div, Brooklyn 16, NY.* Literature describes technique for adding from 30 to 70% more storage equipment to existing areas without additional floor space, and utilizing existing equipment.

PARTS AND MATERIALS

22 ALLOY & STAINLESS STEELS—*Electric Steel Foundry Co, Portland 10, Ore.* 102-page illustrated catalog 175-A includes corrosion resistant data; chemical composition; mechanical properties of corrosion, heat, impact and abrasion-resistant alloy steels. Also describes facilities for production of static, shellcast, and centrifugal castings.

23 CONTROL & TRANSFER SWITCHES — *General Electric Co, Schenectady 5, NY.* 28-page illustrated bulletin GEA-4746B, covers complete line for low-voltage applications up to 600 v ac or dc. Special features, application data, contact diagrams, and ordering information included.

24 PRECISION ROLLER BEARINGS —*McGill Manufacturing Co, Bearing Div, Valparaiso, Ind.* 53-page handbook H-54A gives illustrated information on line. Features, dimensions, load capacities, recommended uses, installation covered.

25 RELAYS — *Stromberg-Carlson Co, Rochester 3, NY.* 23-page bulletin illustrates and describes six general types, most with a number of variations, for industrial applications. Engineering data, design features, ordering, information, mountings and covers included.

26 MULTIPLE V-BELT DRIVES — *Allis-Chalmers Manufacturing Co, Milwaukee, Wis.* 56-page illustrated booklet 20E8297 discusses origin, history, and development; tells how to engineer a drive, provides tables and data, and describes modifications in drives.

27 "CHROMIUM - NICKEL - MANGANESE AUSTENITIC STAINLESS STEELS"—*Allegheny Ludlum Steel Corp, Pittsburgh 22, Penna.* 10-page booklet on 200 Series presents detailed information with charts and graphs on cold rolled mechanical, elevated temp, physical properties, and corrosion-resistance.

28 GEARMOTORS—*Reliance Electric & Engineering Co, Cleveland 10, Ohio.* 8-page bulletin E-2408, "Reduce Speed," describes line incorporating new NEMA motors and completely redesigned gearheads. Types, mountings, enclosures and ratios available covered; features and maintenance illustrated.

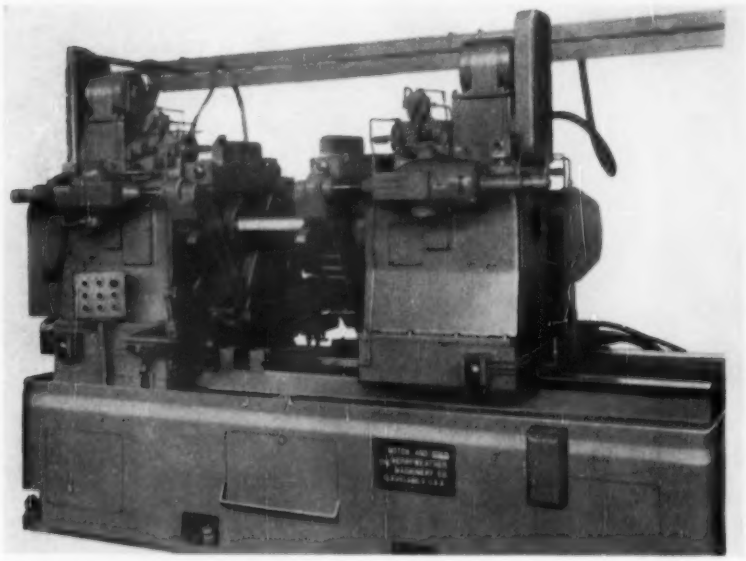
29 AIR CONTROL VALVES—*Airmatic Valve, Inc, Cleveland 9, Ohio.* 4-page illustrated guide covers 17 different lines of valves and accessories.

30 LAMINATED PLASTIC FORMING MATERIAL—*Formica Co, Cincinnati 32, Ohio.* 4-page bulletin illustrates uses of S-52, a lightweight material for stretch forming, metal spinning, and forming dies. Tough, high-pressure product is said to be easily machined, has high resistance to friction and corrosion.

31 ADHESIVE FOR HONEYCOMB STRUCTURES—*Minnesota Mining & Manufacturing Co, Detroit 8, Mich.* 20-page technical bulletin gives engineering data, test procedures and results of new resin-type and elastomeric adhesives used for bonding aluminum to kraft paper honeycomb core. Sandwich materials and construction details discussed, as well as application procedures.

32 STAINLESS STEEL WIRE—*Carpenter Steel Co, New Brunswick, NJ.* 6-page bulletin describes a variety of types. Includes analyses, tensile strengths, physical properties, and gages of 12 types most generally used. Charts give specifications, characteristics, end use. Grouping is broken down into austenitic, martensitic, and ferritic classifications.

New Shop Equipment, Materials and Parts . . .



Milling and Centering Machine

Motch & Merryweather Model 3 MCT milling and centering machine is a universal, production-type machine, which can be quickly set up for lengths up to 48 in. and which drills to a depth of 4 in. if desired. Two triangular fixtures with six trunnion vises index 120° between three stations, at which loading and unloading, milling, and double-end center drilling are performed consecutively.

Indexing fixtures are mounted on anti-friction, cartridge-type bearings keyed to a large steel shaft; hydraulic power controls automatic indexing. Hydraulic-electric torque wrenches are mounted on either side of the trunnion, arranged for quill movement to engage the screw-actuated, self-centering vises for clamping and unclamping. Circuit interlocks prevent trunnion from indexing until machining elements and torque wrenches are in proper positions.

Machine is arranged for complete automatic cycle, with parts being manually loaded into the work-carrying fixtures at machine front, then progressively indexed to the milling and drilling stations, and finally back to the front of the machine for unloading.

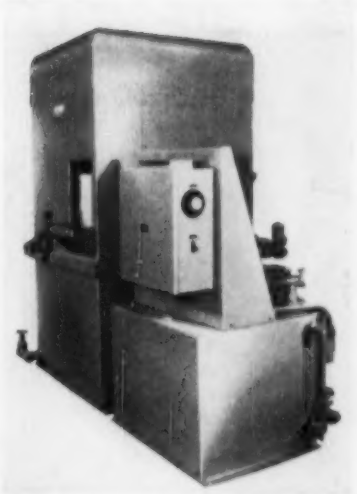
Milling heads are of single-speed type, and are adaptable for carbide tooling. Feed rate of heads is infinitely variable. Drilling heads, single-speed of quill-feed type, also have infinitely variable speed.

Motch & Merryweather Machinery Co, Machinery Mfg Div, 888 E 70th St, Cleveland 3, Ohio

Smith Over-Riding Clutch Controls Angular Location

Smith Noback Device, a type of over-riding clutch, is self-contained unit designed to control movement of a mechanism to a specific angular position. Normally it is installed in a housing to connect the source of power by means of the driving shaft to the driven shaft of the mechanism. When power is applied, both shafts rotate at the same speed. When power stops, device prevents further rotation of mechanism, either from initial inertia force or from external force applied to mechanism from anywhere except original motive power. Application of power to driving shaft unlocks the device instantly.

Morton Bearing Co, 815 Wildt St, Ann Arbor, Mich



Degreaser Cleans Parts With Spiral Uphill Action

Vibra-Degreaser Model MSS-321 moves small parts and chips in a "corkscrew," circular uphill action, passing parts through a liquid immersion, liquid rinse, and solvent vapor zone. It then emits clean metal materials through an unload chute located 42 in. above ground. Parts are first loaded in a synchronized hopper, a component of the machine, from which they descend to a spiral trough and start their upward progress through the machine.

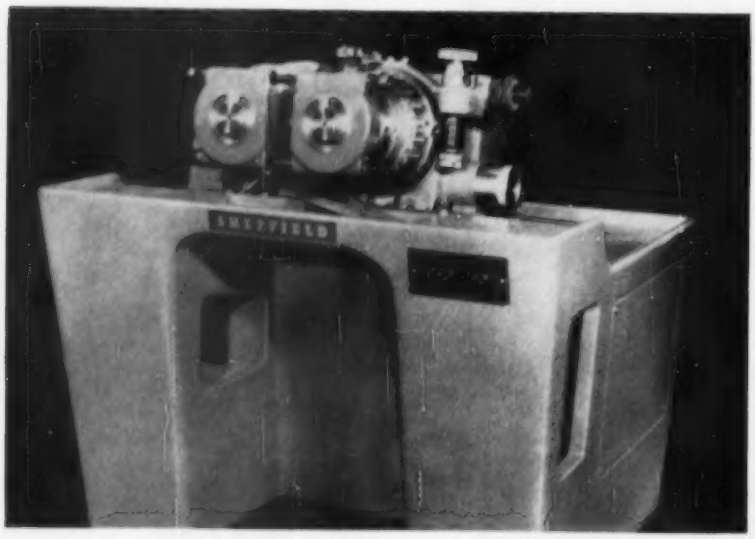
Vibra-Degreaser action is made possible by a combination of flexible, vibrating leaf springs and electromagnets to which the spiral trough is attached. This assembly is energized by a pulsating current which creates the vibration that transports work through the cleaning cycle.

Maker claims that machine is capable of cleaning up to 3000 lb of chips or metal parts per hr, while requiring floor space of no more than 5 x 5 ft. Unit is of heavy-duty, all-steel construction, and has shipping weight of approximately 4500 lb. Solvent capacity is 85 gal.

Manufacturers Processing Co, 1560 Hilton Rd, Detroit 20, Mich

Debris pump for cleaning industrial equipment, called the De-Bree cleaning unit, features a self-priming pump designed so that all types of foreign matter can be pumped without clogging or damaging the pump. Unit is mounted on a two-wheeled cart for easy transporting. Standard 1¼-in. unit is supplied either with 2½-hp, 4-cycle gas engine or 1/3-hp, 110v GE electric motor.

H & H Mfg Co, Dept 21, Clifton Heights, Penna



Sheffield Thread-Rolling Machine

Equipped with hopper feed, circular-roll threading machine will produce up to 5200 parts per hour, ranging in thread size from ⅛ to ¾ in. OD by 2 in. long. Rolling is performed by two interchangeable and reversible precision-ground rolls rotating at different speeds and mounted on heavy-duty spindles. Drive is by positive worm-and-wheel control, powered by a 7½-hp motor. Machine has no cams, slides, hydraulic systems, fixed work rests, or reciprocating motions.

Parts are fed tangentially between the rolls by a revolving work feeder ring, falling free after rolling down a chute to a container. Feeder ring can be magazine loaded, manually or automatically. Pitch-diameter adjustment is accomplished with a leadscrew that advances the right-hand roll and spindle through a micrometer-type unit. Timing of the rolls is infinitely adjustable. Base houses motor, coolant tank, and pump.

Rolls are available for any type thread form within the following size ranges: 0 to ¼ in. OD x 2 in. long; 5/16 to 7/16 in. OD x 1½ in.; and ½ to 9/16 in. OD x 1¼ in.

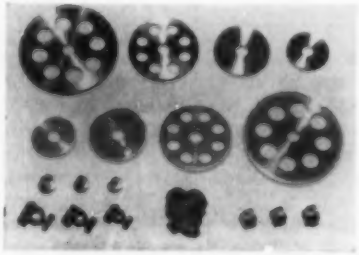
Murchey Div, Sheffield Corp, Dayton 1, Ohio

All-Bronze Coolant Pump

Sutton Model CTU-115 pump has all-bronze pump housing, impeller, and shafts. Unit will pump coolants, cutting oils, soluble compounds, and many other liquids to lathes, presses, and other machines. No bearings or metal-to-metal contact is present.

Unit comes complete with 6 ft of flexible hose, 17-in. flexible nozzle with shut-off valve, 8 ft of rubber cord, and plug. A five-gallon tank is also furnished as standard equipment. Motor is over-size with slow speed for quietness and longer life.

Sutton Mfg Co, Norfolk, Va

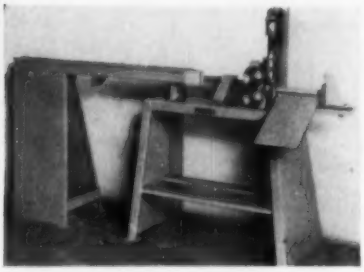


Spur-Gear Blanks and Hubs

Precision spur-gear blanks are available from stock in No. 303 stainless, clear passivated or 24ST aluminum, chromic-acid anodized before cutting. Gears are cut to AGMA precision-1 tolerance. Precision-2 gears are available on request. Gears are stocked in 48, 64, 72, and 96 pitches, 20° pressure angle. Gears are made to fit PIC Type R3 slip clutch, Type K1 pin hub, and Type K2 clamp hub in 3 shaft sizes of ⅛, 3/16, and ¼-in. diameters.

Pin hubs are stainless steel, clear passivated, with stainless-steel setscrews for holding and sub drill for fixed pinning.

PIC Design Corp, 160 Atlantic Ave, Lynbrook, LI, NY



Klaas Cutoff Machine For Extruded Materials

Using standard components, cutoff machine for extruded materials has air cylinders, controlled by microswitches, which actuate rolls and cutoff blade. Rolls pull the extruded material, and dies can be made to mark the material. Work is looped before it reaches roll feed; microswitch at end of conveyor stops machine if loop is taken up.

Any extruded metal that can be sheared can be accommodated, and any length can be cut. Machine takes up to ½-in.-dia stock. Speeds can be adjusted to provide any rate of cutoff.

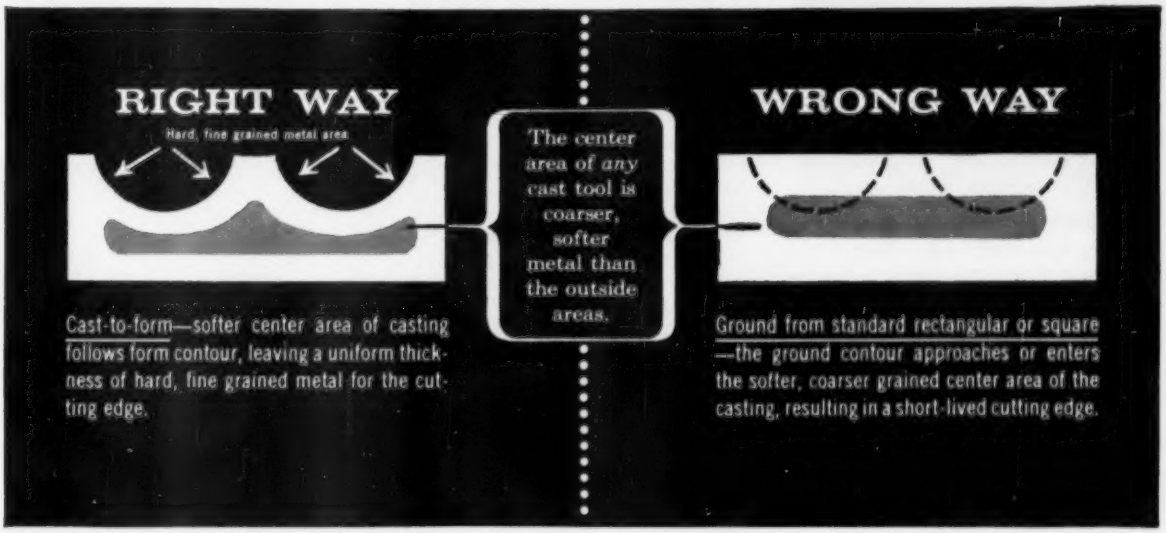
Klaas Machine & Mfg. Co, 4314 E 49th St, Cleveland 25, Ohio

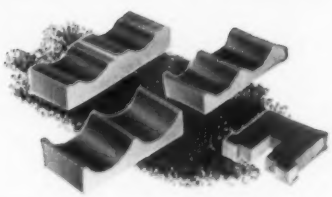
Bench-Grinder Turntable

Turntable for bench grinders features clamp by means of which grinder may be turned so that either end faces operator in the most convenient position; instant change from roughing to finishing is facilitated, and operator does not have to move from one end of machine to the other. Turntable base may be had either with or without drip pan, and will accommodate Prosser Model AA carbide grinder and Model AP precision grinder.

Thos Prosser & Son, Felter Bldg, Tenafly, NJ

HOW TO GET LONGER-LASTING, LOWER COST CAST ALLOY FORM TOOLS


RIGHT WAY
Hard, fine grained metal area
The center area of *any* cast tool is coarser, softer metal than the outside areas.
WRONG WAY
Cast-to-form—softer center area of casting follows form contour, leaving a uniform thickness of hard, fine grained metal for the cutting edge.
Ground from standard rectangular or square—the ground contour approaches or enters the softer, coarser grained center area of the casting, resulting in a short-lived cutting edge.



TANTUNG IS NOT HIGH SPEED STEEL —
it is an exclusive alloy cast to hardness with no subsequent heat treating!

TANTUNG CUTS FASTER—twice as fast as high speed steel. It bridges the gap between maximum speeds possible with high speed steel and minimum speeds practical with cemented carbides.

TANTUNG CONTAINS CARBIDES—of tungsten, tantalum and columbium. This combination gives it superior toughness and lower friction coefficient than ordinary cast alloys.

TANTUNG HAS HIGH RED HARDNESS—it maintains cutting hardness at red heat temperatures well above that of high speed steel.

TANTUNG IS STRONGER—transverse rupture strength about double that of most cast alloys.

Get the Cost-Cutting Edges from the V-R man. Call your local V-R distributor or representative.

Specify V-R TANTUNG Cast Alloy Preformed to your Prints!

Cast-to-form tools last longer! TANTUNG cutting tool alloys are chill cast in permanent molds to impart fine grain structure, high hardness, and high transverse rupture strength—characteristics which permit very high cutting rates and insure long tool life.

By specifying form tools *cast-to-shape* you retain these desirable characteristics. But, as shown in the drawings above, if you grind the form into standard rectangular or square cutting tools, you will approach or penetrate the coarser grained center area of the casting and destroy the very advantages for which you chose TANTUNG in the first place! (This softer center area is common to *all* cast cutting tools because this is the last point to solidify and is not subject to the chill condition on the outside of the casting.)

Cast-to-form tools cost less! The slightly higher original cost of buying your TANTUNG tools cast-to-form is saved many times over by elimination of form grinding costs, faster cutting, longer tool life with more regrinds possible, and reduced downtime for tool changes.

ASK FOR CATALOG

24-page V-R TANTUNG Catalog gives technical data and lists solid tool bits, tipped tools, cut-off blades and toolholder inserts. Write today or call your V-R Distributor or Representative.

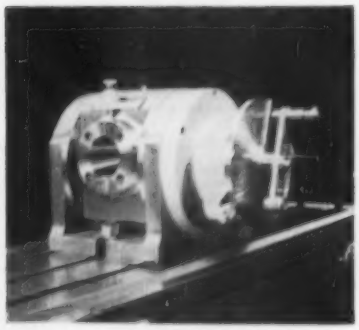
MANUFACTURERS OF CEMENTED CARBIDES AND TANTUNG CAST ALLOYS • TOOLS • BLANKS • TOOLHOLDERS • INSERTS • DIES

Vascoloy-Ramet Corporation

806 Market Street • Waukegan, Illinois

V-R and TANTUNG are registered trademarks of Vascoloy-Ramet Corporation

T-564



Cincinnati Dividing Heads In 10-, 12-, and 14-in. Sizes

Designed primarily for Cincinnati universal milling machines, line of precision dividing heads can be used for a variety of toolroom work, such as gear cutting, cam milling, drilling, and boring. Spindle is mounted on anti-friction bearings, carried in a block having 360° peripheral clamping. Spindle nose and taper hole conform to No. 50 milling-machine standard. Block itself is mounted in a housing to allow 145° angular positioning of the spindle in the vertical plane.

Indexing arrangement at the side of the head consists of a crank with a retractable pin handle, sector for spacing, and reversible index plate. Rotating motion of the crank is translated through a worm to a worm wheel (40-to-1 reduction) keyed to the spindle.

Dividing head is completely enclosed, protecting working parts from dust and chips. Complete equipment includes a tailstock with two-point adjustable center which can be swiveled 10° above or below center; steady rest; center for headstock fitted with driver and draw-bolt; and bracket for connecting headstock to driving mechanism. Optional accessories include high-number indexing attachment, angle plates, raising blocks, and chucks. Catalog M-1924.

Cincinnati Milling Machine Co, Cincinnati 9, Ohio

Automatic Contour Wheel Dresser For Use on Centerless Grinders

Model 83, designed to replace the form bar type dresser on the Cincinnati No. 2 centerless grinder, can also be adapted, with minor modifications of mounting or base, to other centerless grinders. Unit, equipped with automatic downfeed, can dress any profile on the grinding wheel into which the diamond can enter, including perpendicular shoulders.

Cycle is controlled by a single moving slide carrying two enlarged cams inside the housing, one for controlling movement of diamond across grinding wheel, the other for controlling movement in and out of the wheel. Ratio of cams to profile on the wheel may be as high as 20:1 for narrow profiles, and can be quickly changed for wider profile. Dresser can be used for contours where accuracy of 0.0002 in. or better is required, according to the manufacturer.

Hoglund Engineering & Manufacturing Co, 343-9 Snyder Ave, Berkeley Heights, NJ

Boring Bar Cartridge

Sure-Bore is claimed to be the first low-priced micrometer-adjustable cutting tool with positive positioning, rigid clamping, and no backlash in either direction. Graduations are always visible; all inserts are carbide-tipped, sharpened, ready for use.

Boring bars, face mills, fly cutters, and other cutting tools requiring precision adjustment can be made in a matter of minutes, according to the manufacturer. Boring sizes range from 1 to 5-½ in., with ¼, ⅜, and ½-in. toolbits.

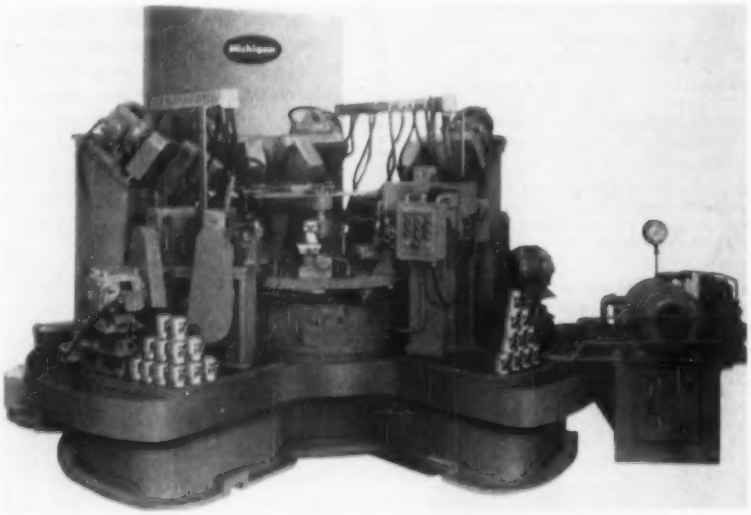
Portage Double-Quick Tool Co, 1026 Sweitzer Ave, Akron, Ohio

Remote-Control Unit For Electric Motors

Rietz unit called Loadtrol will function on motors from 5 to 150 hp, 220 or 440 v, and offers fully automatic remote control of electric motors. Device is activated either by an overload or by an underload current signal, and responds instantaneously on both start and stop function. Working through motor starter to accomplish start and stop control, unit incorporates solenoid and mercury switch to control single motor or group of motors.

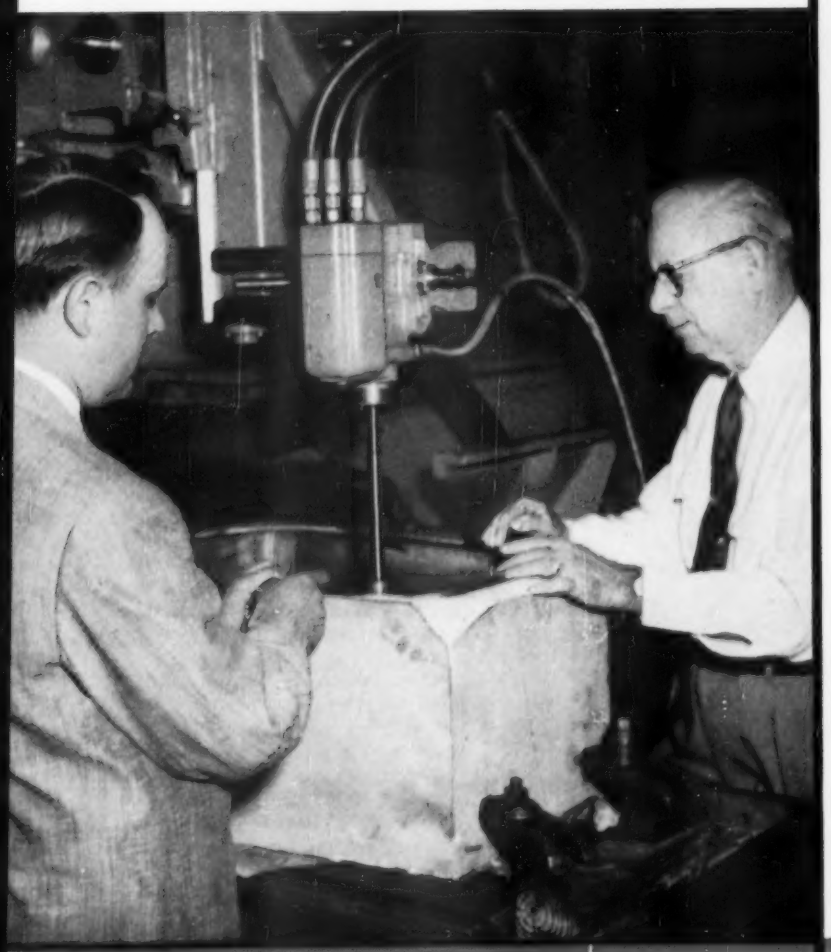
Variety of automatic functions may be assigned to unit, such as motor protection under overload conditions; full-capacity operation of feeders and similar equipment, by permitting motor operation only during periods of optimum load.

Rietz Mfg Co, Santa Rosa, Calif



AUTOMOTIVE PISTONS are finish-drilled at rate of 1200 per hour on Michigan Drill Head Co special machine. During each cycle, unit performs ten separate operations on each piston, finish-drilling 4 angular holes and 6 horizontal smoke holes. 8-station, dial-type machine features company's automatic hydraulic index table and individual automatic indexing fixtures. Attached to 42-in. table is a mounting plate, 60 in. in dia, to facilitate mounting of indexing fixtures, which make possible drilling of different-angle holes—*Michigan Drill Head Co, Box 4643, Detroit 34, Mich*

STANOIL *Industrial Oil tough performer in delicate operation*



A. T. Wallace (right), President of Wallace Tool and Die Company, and Standard Oil lubrication specialist, H. A. Peterson, check sensitivity of new Cincinnati Hydro-Tel Milling Machine which uses STANOIL as hydraulic medium. Howard Peterson has been providing technical service to customers since joining Standard Oil. He is a graduate of General Motors Institute. Howard's customers find this experience pays off *for them.*

Delicate operations with metal requiring almost a surgeon's skill are every day stuff to Wallace Tool and Die Company, Indianapolis. Recently, they purchased a Cincinnati Hydro-Tel Milling Machine for their highest precision work. They selected STANOIL Industrial Oil for the hydraulic medium. The reason for choosing STANOIL: they wanted a hydraulic fluid that could deliver high performance. They wanted a clean hydraulic system, free of deposits that might clog filters and interrupt operations. They wanted smooth operation without pump chatter and without foam. They got these with STANOIL.

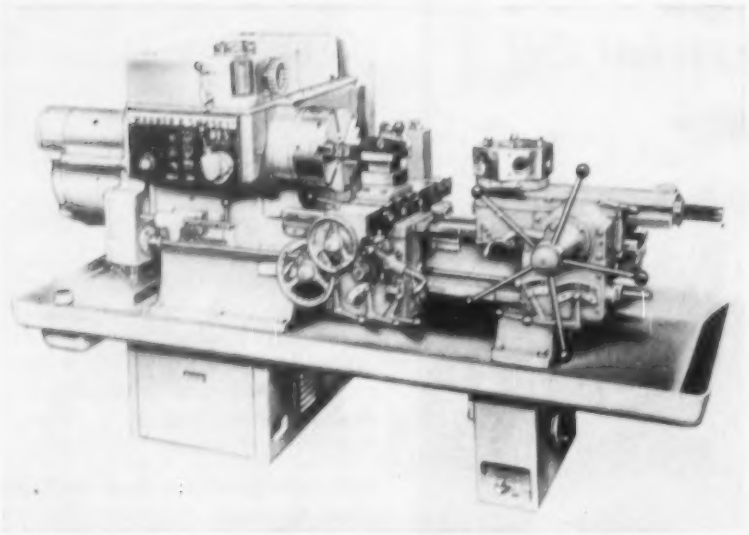
How did Wallace Tool and Die come to choose STANOIL? The answer is not hard to find. They had used STANOIL for hydraulic systems throughout their plant for many years. It has given them the results they wanted so it was natural to pick STANOIL for their new Cincinnati machine.

With STANOIL the machine performs the delicate operation of contour tracing with only 3½ ounces of pressure needed to control the milling cutters. STANOIL gives them smooth, steady, uninterrupted performance.

STANOIL can serve you. In the Midwest a lubrication specialist at your nearby Standard Oil office will be glad to show you. Call him. Or contact Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD

STANDARD OIL COMPANY (Indiana)



Universal Ram-Type Turret Lathes Introduced by Warner & Swasey

Simplified operating controls and faster speed changing through the use of an all-hydraulic headstock are features of No. 4 and No. 5 W & S universal ram-type turret lathes. Both machines are reported fully adaptable to existing tooling, and can be used with latest turret lathe attachments.

Operator's controls are zoned, with one lever at headstock actuating all speed changes; another lever provides forward, reverse, brake, or free-spindle operation. Headstock-mounted speed preselector, calibrated in rpm's, surface speeds, and work diameters, is incorporated in design. All-hydraulic headstock, which eliminates gear shifting by means of constant-mesh helical gearing and direct-acting hydraulic clutches, provides instantaneous spindle-speed changes.

Spindle is equipped with an 8-in. American Standard Type A-1 flanged nose. Six reversible power feeds, cross and longitudinal, are provided with automatic feed trips in feed apron. Hexagon turret revolves on a pre-loaded, tapered roller bearing which causes turret to raise slightly during indexing, eliminating wear on seating surfaces. Hydraulic collet chuck and bar feed are engineered for heavy-duty operation.

Twelve spindle speeds, or 24 unduplicated spindle speeds with a two-speed motor, in a 62.2 to 1 overall range, are standard on both machines. Speeds on No. 4 are 30-1866 rpm with a 15/7½-hp drive motor. No. 5 unit provides 25-1556 rpm with a 20/10-hp motor. No. 4 swings 18⅛ in. over bed and 9½ in. over cross slide. No. 5 swings 20 in. over bed and 10¼ in. over cross slide. No. 5 machine is illustrated above.

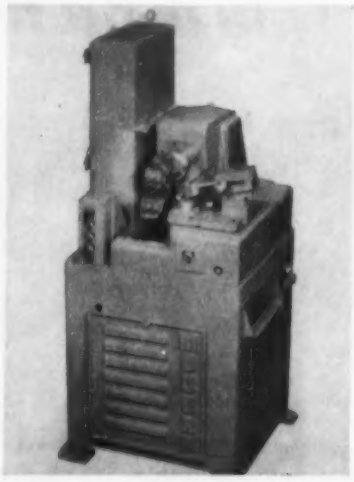
Warner & Swasey Co, 5701 Carnegie Ave, Cleveland 3, Ohio

Elwell-Parker Fork Truck Has 3000-lb Capacity

Cargo-Scout fork-lift truck is designed to handle loads in confined areas at maximum speeds. 3000-lb-capacity unit has compact design with short wheelbase and 360° steering to permit maneuvering in narrow aisles. Device is provided on steering mechanism to prevent steering-wheel kickback.

Additional features include worm drive, packaged unit assemblies, contactor controls, and a caster-type trail axle. Unit shown is available with full-load capacity at 24 in. on 68-in.-high model or at 20 in. on an 83-in.-high model.

Elwell-Parker Electric Co, 4205 St Clair Ave, Cleveland 3, Ohio



Deburring-Chamfering Machine Finishes Gear Teeth

Model BME-14 Duplex is single-station deburring and chamfering machine added to line of Modern Industrial Engineering Co. Machine, which chamfers both sides of a gear simultaneously, removes sharp edges on the ends of gear teeth and at the same time removes burrs resulting from the gear-cutting process.

Spur gears, helicals, and straight-sided as well as involute-form splines from ⅝ to 6½-in.-PD can be handled at a production rate of up to 5 teeth per second per side.

Unit is built to JIC standards. Motor is 1 hp, 1200 rpm. Floor area required is 32 x 42 in., and approximate weight is 1800 lb.

Modern Industrial Engineering Co, 14230 Birwood Ave, Detroit 38, Mich

Turning and chamfering tools, offered by Wesson in twenty sizes and types of RH and LH 30° and 45° angles, incorporate slug-type indexable inserts in band-type Multicut toolholders. Designated as semi-standards, tools incorporate standard low-cost replaceable parts similar to those used on other Multicut holders. Models SDR, SDL, SER, and SEL are designed primarily for chamfering, but are also suitable for turning operations. Prices range from $18.50 to $23.50.

Wesson Co, 1220 Woodward Heights Blvd, Ferndale 20, Mich

Call the man with the ANSWERS!

Your Chromalox representative has the answer to your routine as well as unusual heating problems.

No matter where heat is needed, on the production line, in offices, warehouses, there is a Chromalox electric heating package especially designed for the job. Your Chromalox representative offers you prompt, competent counsel, on all heating problems.

His on-the-spot engineering assistance is backed up by thirty-nine years' experience and know-how in the design, manufacture and application of Chromalox electric heating units.

The Chromalox line, manufactured exclusively by Edwin L. Wiegand Company, is the world's most complete line of electric heating equipment. 15,000 standard types, sizes, and ratings . . . the world's largest stock . . . plus a complete range of controls and accessories.

Contact your Chromalox representative the next time you are faced with a heating problem or write direct for application information.

Edwin L. Wiegand Company • *7577 Thomas Boulevard, Pittsburgh 8, Pa.*

Edwin L. Wiegand Company
7577 Thomas Boulevard, Pittsburgh 8, Pa.

Please send me the literature checked below:

- ☐ General Industrial Electric Heating Units
- ☐ Industrial Radiant Heaters
- ☐ 101 Ways to Apply Electric Heat
- ☐ How to Solve Winter Problems with Electric Heat
- ☐ Process Air Heaters
- ☐ Electric Heaters for Electroplating
- ☐ Thermwire Heating Cable
- ☐ Cartridge Heaters
- ☐ Circulation Heaters
- ☐ Strip Heaters
- ☐ Comfort Heaters
- ☐ Electric Range and Water Heater Units
- ☐ Baseboard Heaters
- ☐ Radiant Wall Panels
- ☐ Fan Driven Wall Insert Heaters
- ☐ Hi-Flow Portable Heaters
- ☐ Utility Spot Heaters

☐ Have a Field Engineer contact me.

Name _____ Title _____

Company _____

Address _____

City _____ State _____

B-7154

Planetary Shaving Process For Tooth Flanks of Spur Gears

High-speed process designed to produce uniform, accurate, thin-tooth sections in the flanks of spur gear teeth has been developed by National Broach. Process is performed on newly designed Model PSA-4-in. Red Ring planetary gear shaving machine. Variety of edge shapes can be produced. Profile of the thin-tooth section closely approximates an involute form, and is said to be usually well within required tenths of a thousandth involute profile tolerances.

Work gear rotates around the cutter centerline during the shaving process. Since the cutter has single cutting edges, which alternately thin first one side of all the teeth and then the other, a timed relationship is maintained between the gear and the cutter.

National Broach & Machine Co, 5600 St Jean Ave, Detroit 13, Mich

Tube Expander Drive Is Controlled by Air

Wilson Torq-Air-Matic is air-driven tube expander drive in which control is reportedly free from operating variables and in which torque output is calibrated in terms of ft-lb instead of arbitrary units of measurement. Torque is registered at the output spindle so that tubes are prevented from being over- or under-rolled.

Control is self-contained, will produce 14 ft-lb torque at 90 psi with maximum consumption of 12 cfm of air. Basic unit is of pistol-grip design and is furnished with an auxiliary handle that may be swivelled to any position. Oil reservoir has been built into the handle. Control section is independent of motor and lubrication is permanent. Total weight is approx 7½ lb and length is 10 in.

Thos C Wilson, Inc, 21-11 44th Ave, Long Island City, NY

Hopper, Feeder for Bulk Parts

Cargill Detroit hopper feeder receives parts, such as gear blanks, bearing races, pistons, and screw machine products in bulk, in any rate, and with random orientation, and discharges parts oriented and aligned for next machine, at any position and on demand of the machine.

Design, which incorporates a slicer bar and means for freeing parts from jamming, is standardized so that unit can be coupled to a wide range of machines, processes, and parts sizes and shapes. Where desired, unit can be equipped with conveyor system which will elevate parts up to 15 ft and deliver overhead to a machine as far away as 50 ft. It can also be equipped with a gage to reject parts which do not meet specified tolerance. No alterations are needed to machines served.

Cargill Detroit Corp, Birmingham, Mich

Metal Strip Incorporates Expandable Portions

Tube-In-Strip is a new mill product in the form of a single strip or sheet of solid copper, brass, or aluminum in which tubes are inflated to desired running lengths in a variety of shapes or sizes.

Solid strip of metal contains expandable portions which can be inflated by the user. Inflation techniques are said to be flexible and generally simple. For example, for thin-walled tube, air pressure may be adequate; for heavy walls, hydraulic means may be preferred. Stamping, forming, bending, and drawing operations can be performed on the material before inflation, or the new product can be inflated before bending, perforation, and similar operations, then further processed by common pipe and tube bending techniques.

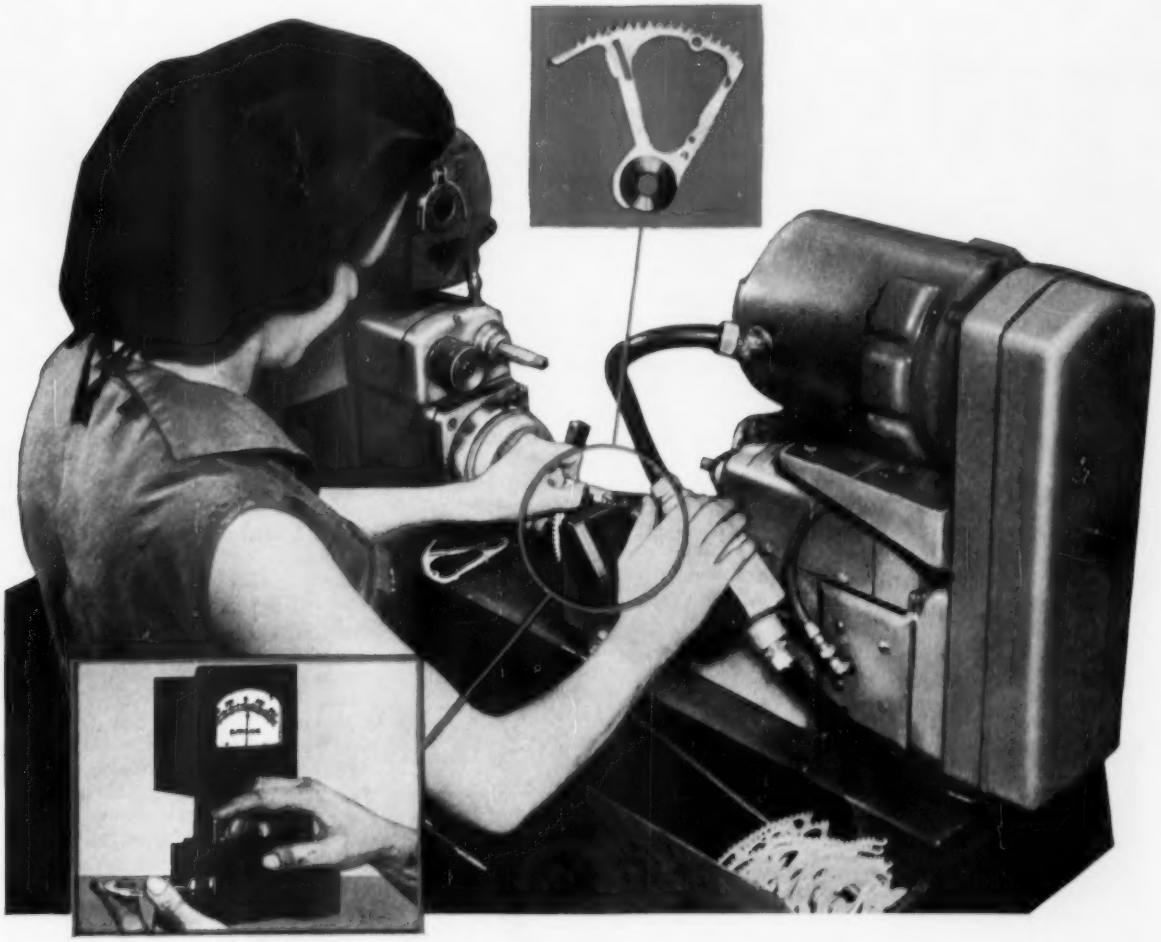
Revere Copper & Brass Inc, 230 Park Ave, New York 17, NY

Grip-Tip Centers Have Replaceable Carbide Tips

Tool steel holder is available in several standard B&S, Morse, and Jarno shank tapers. Solid carbide tips, furnished in ¼ and ½-in. dia, are accurate to 0.0003 in.

Male or female tips are inserted or removed from holders by turning a screw. Adjustable screw in shank positions depth. Clamping action is positive and quick.

Detroit Reamer & Tool Co, 780 W Maple Rd, PO Box 174, Birmingham, Mich



"HARTFORD" Air Hydraulic Drill Units used by Burroughs* to hold precision thickness tolerance

SPOTFACING BOTH SIDES OF A WAFER THIN STEEL GEAR SECTOR TO A THICKNESS TOLERANCE WITHIN .0003" IS ONLY ONE OF THE ADVANTAGES BURROUGHS OBTAINS BY USING HARTFORD DRILL UNITS.

Add up these facts:

1. SPINDLE ACCURACY of units holds parallelism of machined faces.
2. MICROMETER DEPTH CONTROL of Drill Units provides *positive* stop.
3. PRODUCTION DOUBLED over previous method of facing one side at a time. Machining cost cut in half.
4. EXTREME LOW COST of special machine through use of *standard* Hartford components.
5. REJECTS ELIMINATED because the accuracy is *built into the machine.*

*Internationally famous makers of Sensimatic accounting machines.

Another example of better products at lower cost through better methods.

MACHINE TOOL DIVISION
THE HARTFORD SPECIAL MACHINERY CO.
282 Homestead Avenue, Hartford 12, Conn.

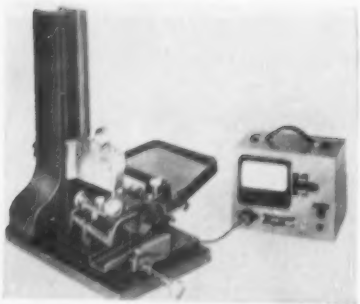
C-506-4

☐ Have Field Engineer call.
☐ Send Application Data Sheet and descriptive Bulletin.

Name _____
Company _____
Street _____
City _____ Zone _____ State _____

HARTFORD Special

NEW SHOP EQUIPMENT, MATERIALS, AND PARTS



Attachment Gages Ball Bearings To 0.0000005-in. Accuracy

Ball-bearing measurement attachment has been introduced for use with Cleveland Instrument's Micro-Ac ultra-precision electronic comparators.

Unit gages ball bearings of from 1 mm up to 1-½-in.-dia to an accuracy of ½ millionth of an inch. It can be used, in addition, for random sphericity gaging.

Cleveland Instrument Co, 735 Carnegie Ave, Cleveland, Ohio

Rockford Heavy-Duty Slotter Has Hydraulic Drive, Pendant Control

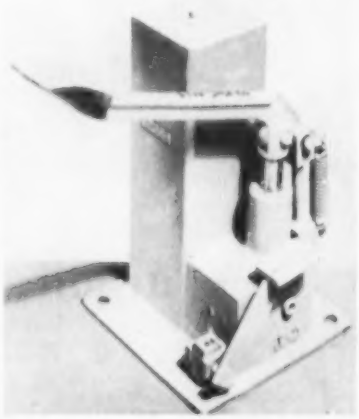
Model SM hydraulic slotter is available in 36- and 48-in. stroke sizes, and is designed for accurate, rapid machining of all metals. All cross, longitudinal, and rotary movements are pendant-actuated and controlled.

Machine is equipped with full hydraulic drive, having two speed ranges, with servo control to the pump so that cutting speed may be infinitely varied from zero to maximum in either range. Feeds are hydraulic and also infinitely variable. Two-speed traverse is available, enabling operator to position work to a few thousandths without manual movements, although manual control of all movements is available from either side of the machine.

Machine is equipped with built-in dividing head arranged for power operation. Pre-determined counter automatically stops table for any selected number of turns within one-tenth of a revolution. Position of upper and lower reverse dogs on the ram may be changed from push-button station, so that operator can lengthen or shorten stroke without using levers. Ram may also be locked from a button on the pendant.

Other features: ram may be tilted up to ten degrees; toolholder is arranged with auxiliary clamping surfaces for max efficiency in holding slotting bar; hydraulic tool lifter is available as optional accessory; 40-hp radial-piston pump is used for hydraulic power.

Rockford Machine Tool Co., Dept A, 2500 Kishwaukee St, Rockford, Ill



Concentric-Piston Pump

Hi-Lo two-speed concentric-piston pump, made entirely of steel, is available for hand or foot operation, and is activated by a single lever or pedal. In operation, hydraulic rams are raised until a predetermined internal pressure is reached in the system; at this point, job is taken over automatically by specially designed high-pressure concentric piston which generates as much as 10,000 psi.

Automatic changeover in operation from high-speed low-pressure to low-speed high-pressure principle can be adapted to special problems involving custom-design requirements.

Star Jack Co, Inc, 420 Lexington Ave, New York 17, NY

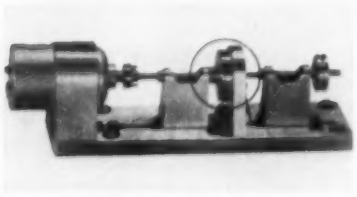
Lock-and-Eject Adapters For Multi-Spindle Machines

Scully-Jones lock-and-eject mechanism is reported to speed and simplify tool changes and minimize tool pull-out. Adjustable adapters are designed for use on multiple-spindle machines doing drilling, tapping, and similar work.

To change a tool, operator turns threaded nut to unseat chuck which grips cutting tool. When new tool is in place, nut is turned to its locking position; no pounding or excessive torsion is needed to lock tool in place. Threaded nut is fitted with spanner wrench holes on its OD and face to speed tool changes.

Four-slot chuck furnishes four-way gripping action to hold tool in place and reduce damage due to pull-out. Wide range of sizes of drills, reamers, and taps may be accommodated by changing chucks in the adapters.

Scully-Jones & Co, 1901 S Rockwell St, Chicago 8, Ill

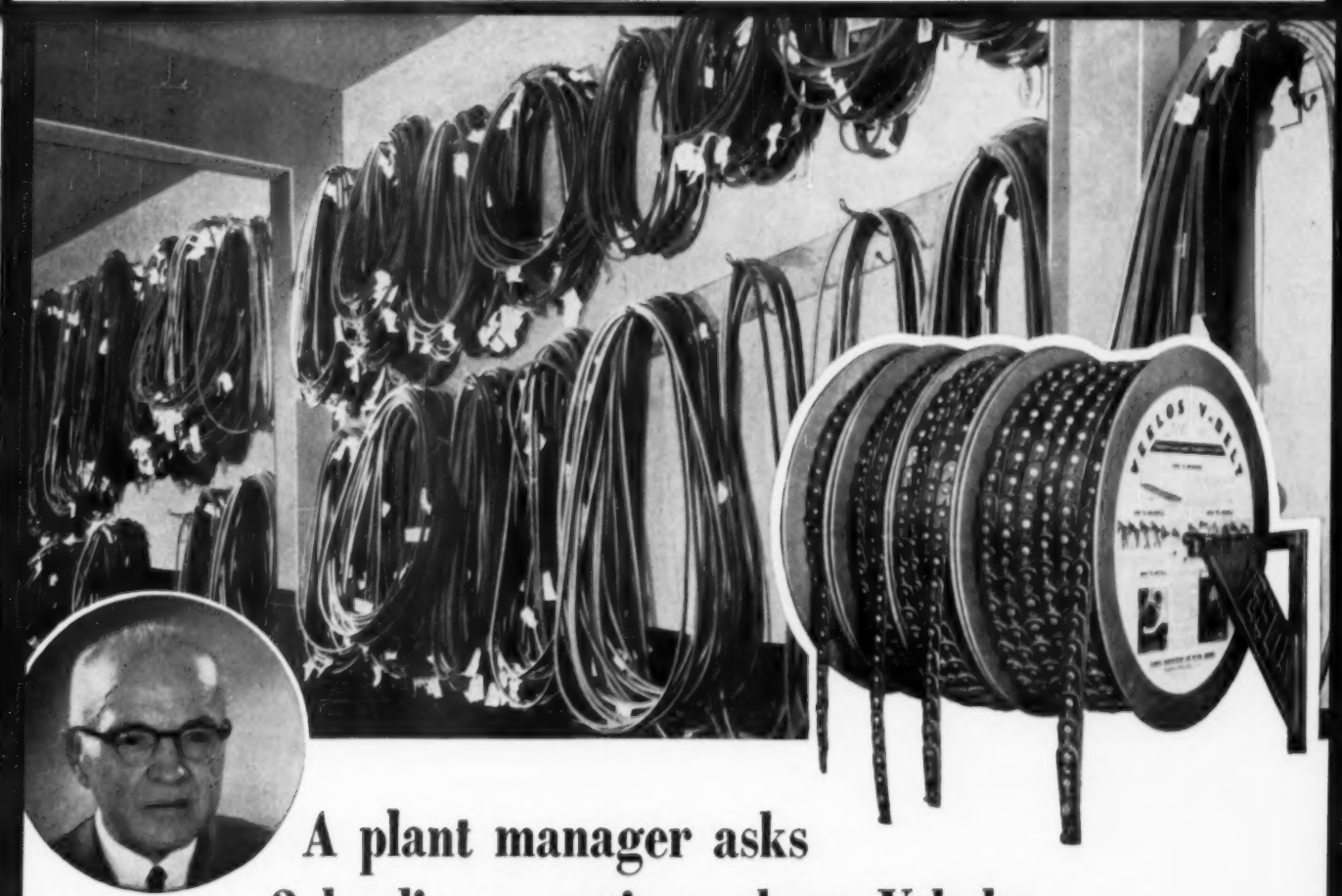


Permanent Magnetic Clutch Requires No Electric Current

German-designed clutch requires no electric current for operation except an impulse for engaging or disengaging.

Originally developed for the instantaneous operation of tape recorders (control button requires only a light touch and no pressure), a variety of applications are foreseen in the servo-mechanism, automotive, and air conditioning fields. Unit will be available in fractional horsepower range, and later for larger applications.

Locke Machine Co, 971 E 63rd St, Cleveland 3, Ohio



A plant manager asks 3 leading questions about V-belts

1 "I stock 85 different sized sets of belts—how can Veelos help me?"

With *four* 100′ reels of Veelos (O, A, B, C widths) you can replace as many as 316 different sizes of endless belts —and store your Veelos in *inches of space!* Veelos cuts your inventory to a minimum. No obsolescence or deterioration, no worries about specific sizes. With Veelos, your storage and inventory problems are licked!

2 "How does Veelos cut installation and down-time?"

Veelos is an *adjustable belt.* With Veelos, there's no tearing down outboard bearings, no resetting, tilting or moving motors to make belt replacement or repairs! And you don't have to replace a complete matched set because of one loose belt—Veelos belts adjust to any length, can be altered by adding or removing links!

3 "How do I eliminate costly belt vibration?"

Install Veelos in place of ordinary belts! Veelos belts are absolutely uniform; every stud and link is identical; every foot of the reel is identical and uniform; they're perfectly balanced. Your Veelos salesman can easily prove to you with a Veelos Vibration Analyzer (tested against any V-belt you might now be using) that Veelos *cuts vibration up to 90%!*

VEELOS
THE BALANCED
LINK V-BELT

Veelos is known as Veelink outside U.S.A.

Get your free Veelos Data Book; many pages of important information on belt drives. Write to:

MANHEIM
Manufacturing & Belting Company
101 Stiegel St., Manheim, Pa.

"Industrial Belt Specialists Since 1911"

©M.M.&B. Co. 1956

Adjustable to any length • Adaptable to any drive • Balanced power • Constant power • Vibrationless power

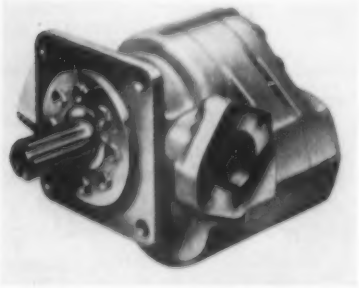
Sundstrand Milling Unit Equipped With Three-Dimensional Tracer

Tracer milling unit is self-contained, can be transported to several different stations on a large work part, or several units can be applied to a sub-base to provide a multi-station machine. Ram support has transverse and longitudinal keyways with suitable mounting provisions on all four sides and the end. Tracer stylus arm also has several manual mounting positions to increase further the possible uses of the unit.

Transverse and longitudinal movements of cutter are 12 in., and depth movement is 8 in. All three movements are manually controlled from a single stylus tracing unit which enables duplication of patterns on workpieces. Each movement has a quick shut-off valve for independent use of any one movement. Cutterhead slide has micrometer-screw depth stop for accurate depth location along full range of cutter travel. Linear and depth duplicating speed of cutter is variable within a range of 1 to 50 in. per minute.

Unit illustrated has a belt-driven 3-hp head with 4 speed changes of 200, 400, 900, and 1800 rpm. Also available is a 3-hp head with infinitely variable speeds between 200 and 1800 rpm. 5-hp heads of either speed type can also be furnished.

Sundstrand Machine Tool Co, Rockford, Ill



High-Volume Hydraulic Pumps

Hydreco Series 3600 hydraulic pumps are especially engineered for installations where space is limited and adverse conditions exist. Pumps for heavy mobile and industrial equipment will deliver 65, 90, or 110 gpm depending on the model.

Speeds range to 2000 rpm, pressures to 1500 psi, and fluid hp to 150. Companion control valves have also been designed for the series.

Hydreco Div, New York Air Brake Co, 1100 E 222 St, Cleveland 17, Ohio

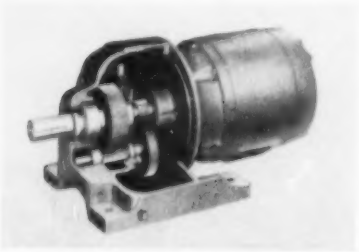
Degreaser and Parts Cleaner

Vic degreaser is made to remove soil through room-temperature solvent action, intensified by a pressure jet. Solvent enters through flexible hose, to which is attached a cone-shaped bristle brush which is manipulated manually. Pump is operated by a foot switch.

Degreaser comes with submerged centrifugal pump, submerged in solvent to eliminate stuffing box and seal leakage; flexible hose and brush; all necessary piping; foot switch; screen-metal work rest; and special filter screen to catch heavy dirt particles.

Specifications: 39 in. long, 18 in. wide, and 32 in. high; 12-gal solvent storage capacity; 150-lb shipping weight; 110v, 60c, single-phase power supply.

Vic Manufacturing Co, 1313 Hawthorne Ave, Minneapolis, Minn



Gearmotors and Motogears in Redesigned Line

Link-Belt's line of Gearmotors and Motogears has been redesigned in keeping with new NEMA motors sizes; compactness and quiet operation are stressed, as well as oil-tight design. Ratio changes are simplified through the use of only one low-speed gear set per drive size. An integral, positive-locking backstop is available with either type of unit, and can be installed at any time without additional parts or modifications.

Gearmotor (illustrated above in phantom view), with rabbet-fit, flange-mounted NEMA motor, maintains positive and permanent motor alignment. Flange is standardized at one size per motor to permit use of a more universally applicable motor. Type DF double-reduction Gearmotors have ratios from 6.2:1 through 31.4:1 and transmit up to 30 hp. Type TF triple-reduction units have ratios from 38.4:1 through 292:1 and transmit up to 20 hp.

Motogear (not shown) is designed for applications destructive to ordinary gear drives, where heavy shock loads must be handled without damaging effect. Motor can be replaced quickly by removing four bolts and separating coupling. Type DB double-reductions units have ratios from 6.2:1 through 38.4:1 and transmit up to 60 hp. Type DB triple-reduction units have ratios from 47.1:1 through 292:1 and transmit up to 20 hp.

Link-Belt Co, Dept PR, 307 N Michigan Ave, Chicago 1, Ill

HEAVY EXTRUDED SHAPE

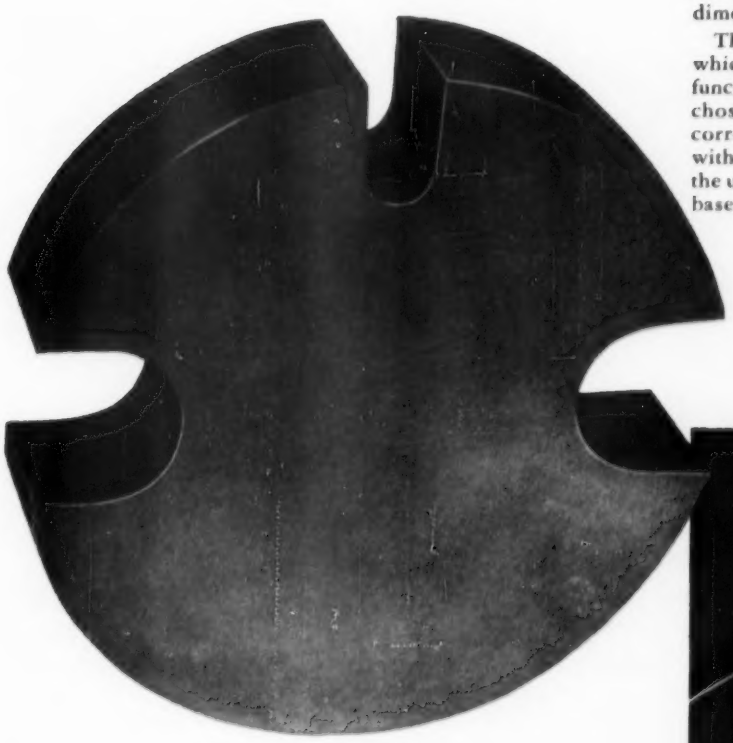
Over Saves 25¢ per lb.

FOR THE STRONG ELECTRIC CORP.

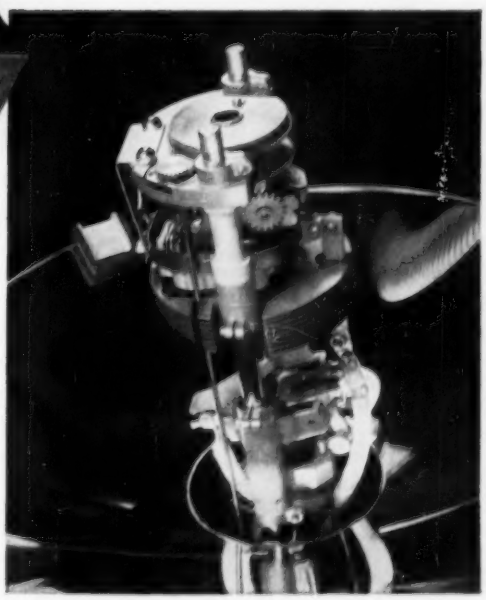
The unusual thing about this copper extruded shape is that it saves money in first cost as well as in machining time. The double economy amounts to over 25¢ per pound. The large illustration shows the shape as supplied in the form of a slug or pre-formed disc, 1 3/16" x 5". This begins as a long extrusion, from which Revere cuts the discs, and pickles them before shipping.

The customer is The Strong Electric Corp., Toledo 2, Ohio, which originally tried plate and bar, but found costs were too high. Revere Product Engineers, Methods and Production Departments collaborated with the company on the problem, and were able to develop the unusually heavy and economical shape. Strong reports a number of savings. One is that the shape is machined quickly and perfectly, with almost no rejects. This is due to the denseness and uniformity of the metal, a result of the high pressures exerted during extrusion. (Finishing operations include drilling bolt holes and cutting cooling fins.) As a secondary result of improved machining, the customer does not have to keep large inventories of metal to take care of spoilage, nor handle large quantities of scrap. Further, Revere supplies the discs in the correct thickness, eliminating a cutting-off operation for Strong. Incidentally, we are glad to supply shapes cut to dimensions, or in long lengths, as desired.

The completed part is an obturator-probe, which fulfills a control and heat dissipation function in a powerful searchlight. Copper was chosen for its ability to conduct heat and resist corrosion. Revere will be glad to collaborate with you in your search for economies through the use of extruded shapes in copper and copper-base alloys, and aluminum alloys.



Copper Extruded Shape, 1 3/16" x 5", as furnished.



Shape in place in a carbon arc searchlight mechanism.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

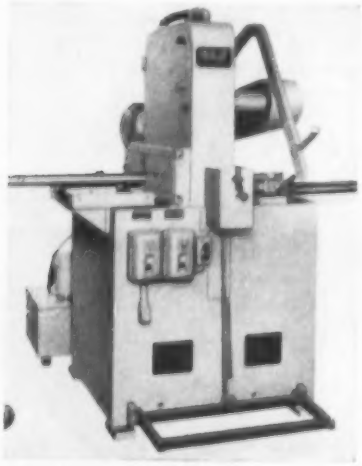
Mills: Baltimore, Md.; Brooklyn, N. Y.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Newport, Ark.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere.

Wilton Introduces Redesigned PowRarm Work Positioner

Design changes on Wilton PowRarm work positioner include new operating handle with Bakelite knob mounted well above bench level top; all steel parts now cadmium-plated to eliminate corrosion; new, heavy-duty finish.

Jeweler's vise is shown mounted on the "Junior" model; by replacing this with other holding fixtures, varied types of work weighing up to 24 lb can be held in any position desired.

Wilton Tool Mfg Co, 9525 Irving Park Rd, Schiller Park, Ill



Wet-Abrasive Cutter Has Oscillating Action

Model 64 oscillating wet-abrasive Cutamatic is high-speed, heavy duty addition to line of Campbell Machine Div of American Chain & Cable Co. Equipped with an Allison abrasive cutting wheel, up to 18 in. in diameter for certain applications, it will sever sheets, angles, channels, pipes, tubes, and solids made of a wide variety of metals. According to builder, machine will cut 3-in.-dia solids, 4-in-dia tubing, and 6 x 1-in. steel plate at 90° to axis at speeds of approximately 4 sec per sq in. of material being cut.

Wheel and work are fed manually for cutting operations, and work clamps are operated by a foot treadle. Oscillating unit is driven by a 1/3-hp geared-head motor. Oscillating link carries the swing arm on one end; other end is mounted on a heavy bracket attached to the base plate.

Unit is furnished with a 10-hp enclosed, fan-cooled motor to drive the abrasive cutting wheel. Dimensions are 68 x 62 x 65½ in. Coolant system pumps coolant at rate of 30 gpm through a hose into top of the wheel guard, which encloses wheel except for openings on either side for entry of work. Net weight with electrical equipment is 2000 lb.

Campbell Machine Div. American Chain & Cable Co, Inc, Bridgeport 2, Conn

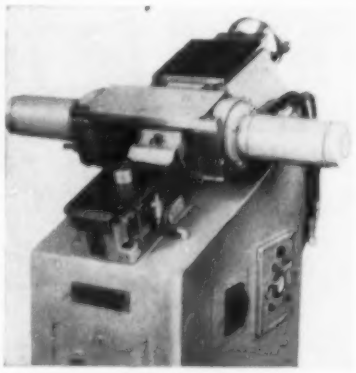
Denison One-Ton Press For Multiple Operation

One-ton Multipress is designed for such operations as assembling, riveting, punching, marking, trimming, pelleting, compacting, testing, straightening, broaching, and swaging. Unit operates on 110v, 60c, single-phase circuit, but can be wired for operation on 220v single-phase. Entire unit is self-contained for easy installation and simple operation.

Hydraulic system is a single-power unit that can be removed and replaced in a few minutes. Machine weighs 225 lb, stands only 22 in. high, and develops ram pressure of 500 to 2000 lb.

Operation of hydraulic unit is by electrical controls which energize a solenoid controlling the ram. Other specifications: ¾-hp motor, 3-in. stroke, 2-sq-in. piston area.

Denison Engineering Co, Columbus, Ohio



Noblewest Marking Machines Have Twin-Ram Heads

Series 46 marking machines combine a pneumatic pressure ram for depth of mark and a pneumatic die slide for roll-marking round and flat surfaces in one integral unit. Twin-ram head can be mounted horizontally, vertically, or at an angle.

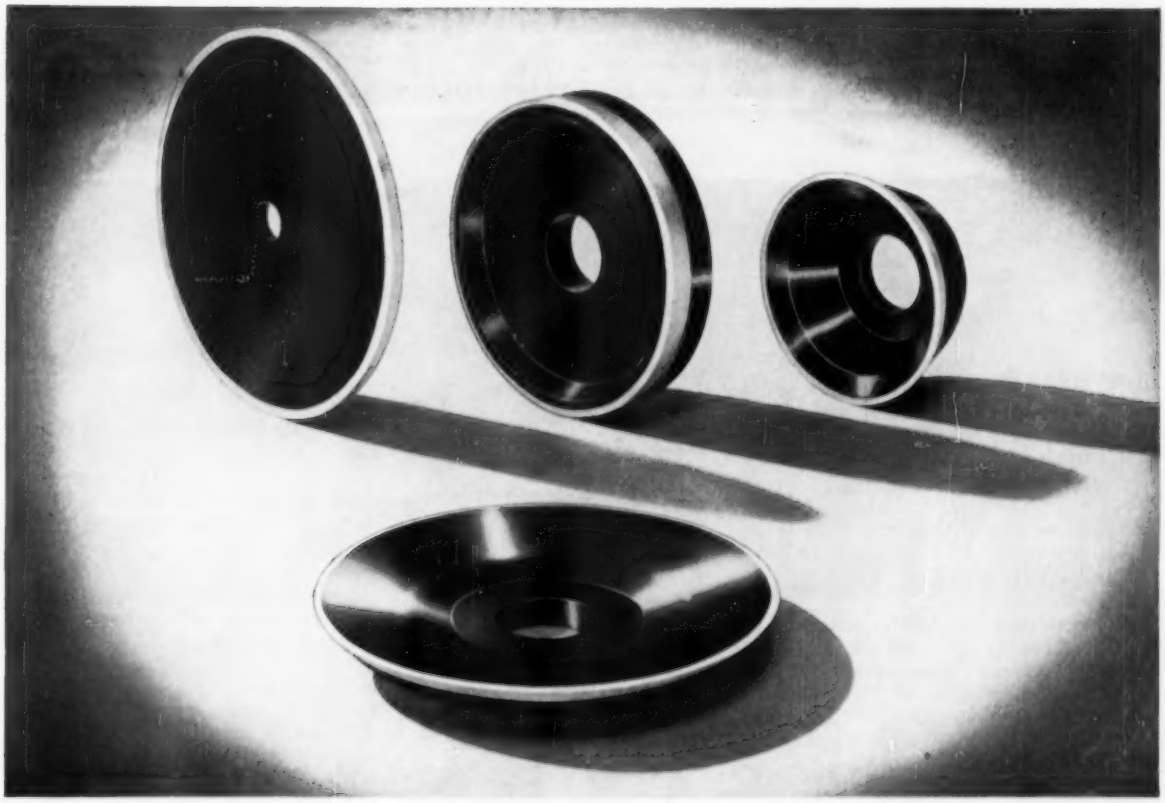
Machines combine Noblewest roll-marking process with company's Cyclomatic control, which provides electro-pneumatic circuit for completely automatic cycling. Semi-automatic cycling is used for short production runs or for a new or inexperienced operator. Cyclomatic control can be set to pace operator's abilities.

Model 354 (illustrated) in series includes an air-operated work ejector for automatic unloading. Frame of machine is tilted at a 20° angle to facilitate loading and unloading. Flush-mounted components are readily accessible from rear of machine. Unit will mark bearing races of from 1- to 6-in. diameter.

Noble & Westbrook Mfg Co, East Hartford, Conn

High speed ground thread piloted taps are available in five fractional sizes ¼ through ½ in. in the H-3 tolerance and in both NC and NF pitches. They are also furnished in three machine screw sizes No. 6 through No. 10 in the H-2 tolerance and in both NC and NF pitches. Fractional size and machine screw size piloted tap sets are also available in full range of sizes.

Threadwell Tap & Die Co, Greenfield, Mass



MANHATTAN Diamond Wheels
Give You Faster, Cooler Cutting Action

No other diamond wheels offer as high a degree of cutting efficiency for surface, cylindrical or internal grinding operations. That's because every Manhattan Diamond Wheel is specially *bonded* to assure precision grinding at top speed without loading or glazing . . . designed in the *exact* size and shape for your particular job requirements. Resinoid bonded Manhattan Diamond Wheels for tungsten carbide grinding permit cool, free cutting with light pressure . . . eliminate the danger of damage to heat-sensitive carbide, carbide tips and inserts. Special metal bonds give you the finish you want in grinding glass, quartz and ceramics. And because they will not load or glaze, Manhattan Diamond Wheels require no dressing . . . for either wet or dry grinding operations.

Specify faster, cooler cutting Manhattan Diamond Wheels from Manhattan's wide variety of surface-contact shapes . . . in the diamond concentration and grit size best suited for your grinding operations. You'll get higher wheel efficiency and longer life . . . "More Use per Dollar" . . . on the toughest job. Write to DIAMOND WHEEL DEPARTMENT.

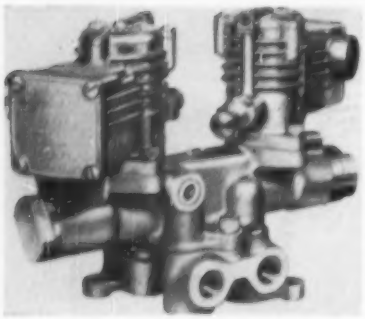
RM625

R/M

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings • Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Laundry Pads and Covers • Bowling Balls



Four-Way Pilot Valve In Double-Solenoid Model

Double-solenoid Speed King is built to JIC standards; pilot solenoids and valve are fully enclosed, and unit is both moisture- and dust-proof. Unit is said to require only momentary electrical contact for operation and to be capable of controlling up to 600 cycles per minute.

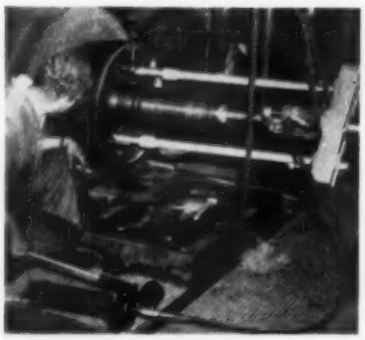
Solenoid coils, completely covered with molded epoxy resin, are unaffected by oil or moisture. Valve body is machined casting of Navy M bronze and valve stem is hard-chrome-plated stainless steel, so that unit offers high resistance to corrosion. Pilot plungers and valve stem are the only moving parts; there are no springs in the main valve.

Valves are available in pipe sizes of ¼, ⅜, ½, ¾, and 1 in., with foot or sub-base mounting. Pressure ranges in psi are 35-200 air and 35-125 hydraulic oil for both single and double solenoid units with internal pilot supply; 0-250 air and hydraulic oil for valves with external pilot supply; 50-125 water for units with internal pilot supply and within 1 in. Hg absolute vacuum for valves with external supply.

Valvair Corp, 454 Morgan Ave, Akron 11, Ohio

"48-Frame" motor line, 1/20 to 1/3 hp, designed to save weight and space, has aluminum end brackets, cluster-type aluminum fan, drip-proof standard frame. Totally enclosed, unit heater, permanent split capacitor types and others are available in both rigid and cushion base.

Century Electric Co, 1806 Pine St, St Louis 1, Mo

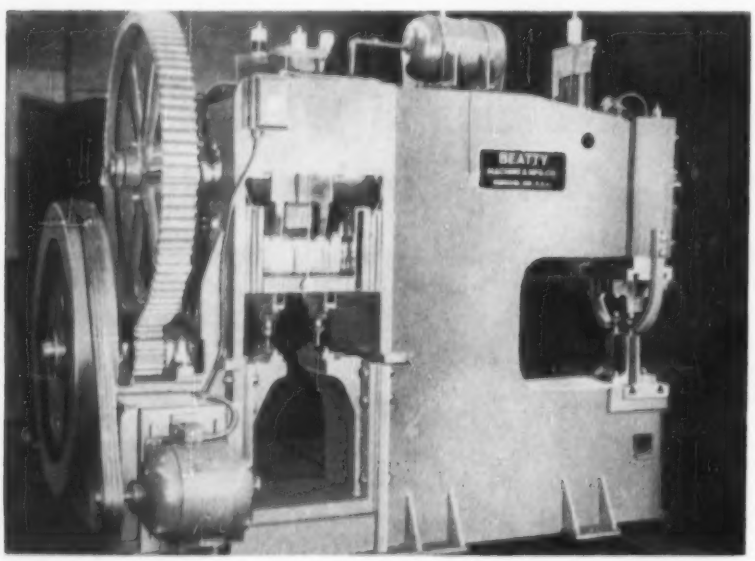


50-ton Hydraulic Pulling Set For Heavy-Duty Maintenance Work

Set includes all basic items to remove and install gears, bearings, pulleys, sheaves, pinions, sprockets, and other tight-fitting parts. It incorporates the 50-ton Power-Twin center hole hydraulic ram designed especially for OTC pulling systems. Set is available with either electric or hand-operated pump.

Pulling with hydraulic power is said to be accomplished without distortion to parts; remote application of power eliminates danger to personnel working on the job.

Owatonna Tool Co, 383 Cedar St, Owatonna, Minn



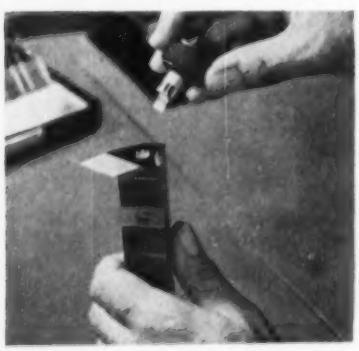
Beatty Beam Punch of 100-ton Capacity

No. 7 detail beam punch is mechanically driven open-throat-and-guillotine type which will punch up to a 1¼-in. hole through 1-in. material. Machine has a capacity of 100 tons, and is said to accomplish punching of I-beams in three passes instead of five, as well as to eliminate end-for-end turning of beams.

Mounted in open-throat portion of machine are high dies available for punching webs of beams, angles, channels, and flat plates. Guillotine portion of machine is provided with two overhanding bolsters with tools for punching holes in flanges on either side of beam webs.

Flange-punch tools are arranged so that when moved to small ends of bolsters, small beams can be punched while heavier beams are punched with tools moved back on bolsters.

Beatty Machine & Mfg Co, Hammond, Ind



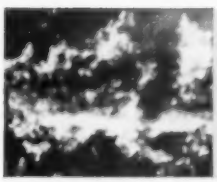
Torque Screwdriver Developed For Square Gage Block Assemblies

Unit "slips" at a fixed torque. When used to tighten tierod screws in a stack of square gage blocks, it develops a pressure which has been established by laboratory test as sufficient to maintain a rigid assembly of wrung blocks but is not great enough to cause distortion.

Screwdriver is designed for use after blocks have been cleaned and wrung by hand to eliminate distortion resulting from application of direct clamping pressure sufficient to wring the blocks.

The DoAll Co, 254 N Laurel Ave, Des Plaines, Ill

Scratch Test Proves Black Granite Most Durable Surface Plate Material

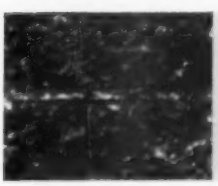


PINK GRANITE

Mica content is readily sliced . . . a poor surface material.

GRAY GRANITE

Here again mica soon causes a poor surface finish.



BLACK GRANITE

Mica so evenly distributed in minute size that the line you see is not a scratch but a smear of metal from the razor blade.

Free 10 Day Trial Offer Allows User to Check for Himself

Here's a test anyone can apply, where you can see the difference.

At the left are three photos, magnified 30 times, of razor scratches in three types of granite used for surface plates.

Notice the absence of a marked scratch in the black granite. The dense, uniform grain structure of black granite completely stopped the sharp edge of the razor from "digging in". It's the large areas of soft mica that readily revealed the scratch. It is the presence of this mica that will cause fast wear, impairing the flatness within a relatively short time.

DoALL Black Granite contains mica but only in very small grains uniformly distributed between the extremely hard feldspar, hornblende and pyroxene elements.

Try a DoALL Black Granite Surface Plate free for 10 days. You'll readily see the difference. Simply fill out and mail the coupon below. Select the size you wish from the list to the left of the coupon. Mail to: ***The DoALL Company, Des Plaines, Ill.***

Ask for the DoALL Black Granite Catalog, today!

DoALL

Des Plaines, Illinois

All types of gaging equipment available through 38 friendly DoALL Sales-Service Stores.

Select any one of these sizes for a free 10 day trial offer:

SIZE	LEDGES
8" x 12" x 2"	none
12" x 18" x 4"	2
12" x 18" x 4"	4
18" x 24" x 4"	2
18" x 24" x 4"	4
24" x 36" x 5"	2
24" x 36" x 6"	4

FREE 10-DAY TRIAL OFFER!

DoALL Company, BG-1
Des Plaines, Illinois

Size_____

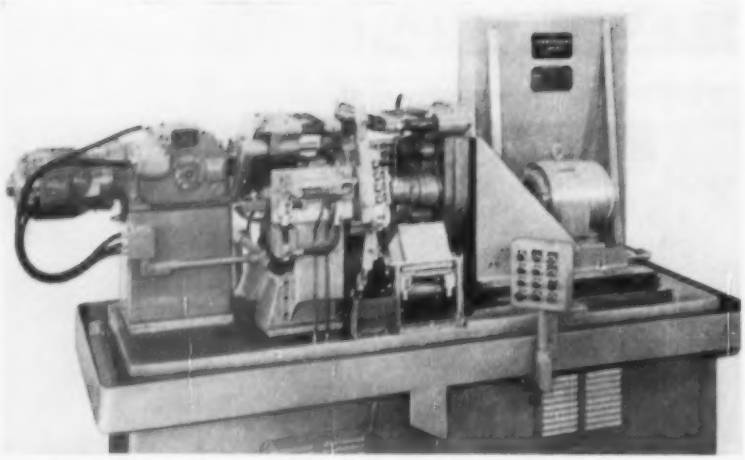
Company_____

Address_____

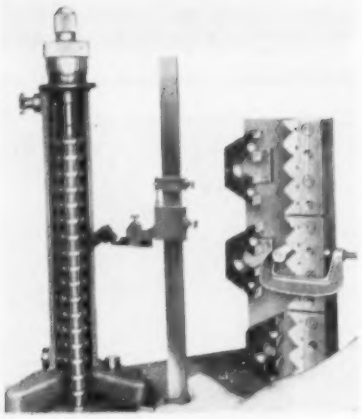
City_____ Zone_____ State_____

Name_____

Title_____



AUTOMOTIVE STEERING KNUCKLES are machined on Hartford Special vertical indexing drilling and chamfering machine at production rate of 1600 per hour at 100% efficiency. Machine employs one cam-feed unit and one barrel cam-feed unit. Features include quadruple loading and automatic clamping, unclamping, and ejection—*Hartford Special Machinery Co, Hartford 12, Conn*



18-in. Pla-Chek Gage Checks Medium-Size Work

New model may be accurately set 5 to 20 times faster than other methods of comparable accuracy, according to manufacturer. Accuracy to 0.00005 in. throughout entire 18-in. range is guaranteed. Since no auxiliary gage blocks are necessary, dimensions may be taken either from surface plate or from a base line on work.

Micrometer thimble, graduated to 0.0001 in., enables dimensions to be taken between the 1-in. steps of the measuring bar. Adjustment up or down permits readings to be taken relative to center-line or other reference line on work.

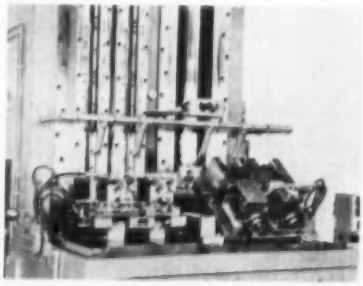
Cadillac Gage Co, Detroit, Mich

Norgren Airline Filters Available in Larger Sizes

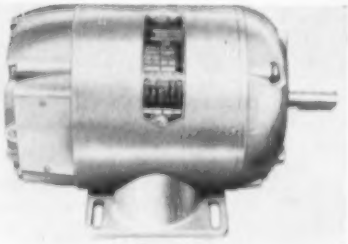
Filters with automatic draining facilities can be furnished in ¾ and 1-in. pipe sizes.

Models 11,200-6 and 11,200-8 are available with choice of three types of filter elements for removal of solids: the standard 200-mesh wire screen (74 micron), and two optional 64 and 25-micron sintered bronze elements. Float-actuated drain mechanism discharges collected moisture automatically under constant or fluctuating air pressure and with or without air flowing. Water capacity of approximately 1¼ pt (which controls draining frequency) keeps wear on drain mechanism at a minimum. Details in Form 529.

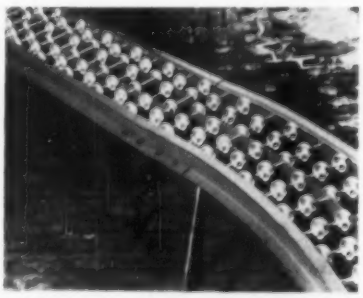
C A Norgren Co, Englewood, Colo



AUTOMATIC TILT-UP FIXTURES mounted in duplicate on 15-ton, 66-in. stroke Model RT dual ram broaching machine speed broaching of connecting rod half rounds and mating faces. Production rate is 550 pr hr, processing two at a time on each ram—*Colonial Broach & Machine Co, PO Box 37, Harper Station, Detroit 13, Mich*



SLIP RING MOTORS are now available as standard units in fractional rating of ¼, 1/3, ½, and ¾ hp. Small No. 66 frame size represents approximately 2-in. reduction in both length and diameter from former smallest size —*Reuland Electric Co, Alhambra, Calif*

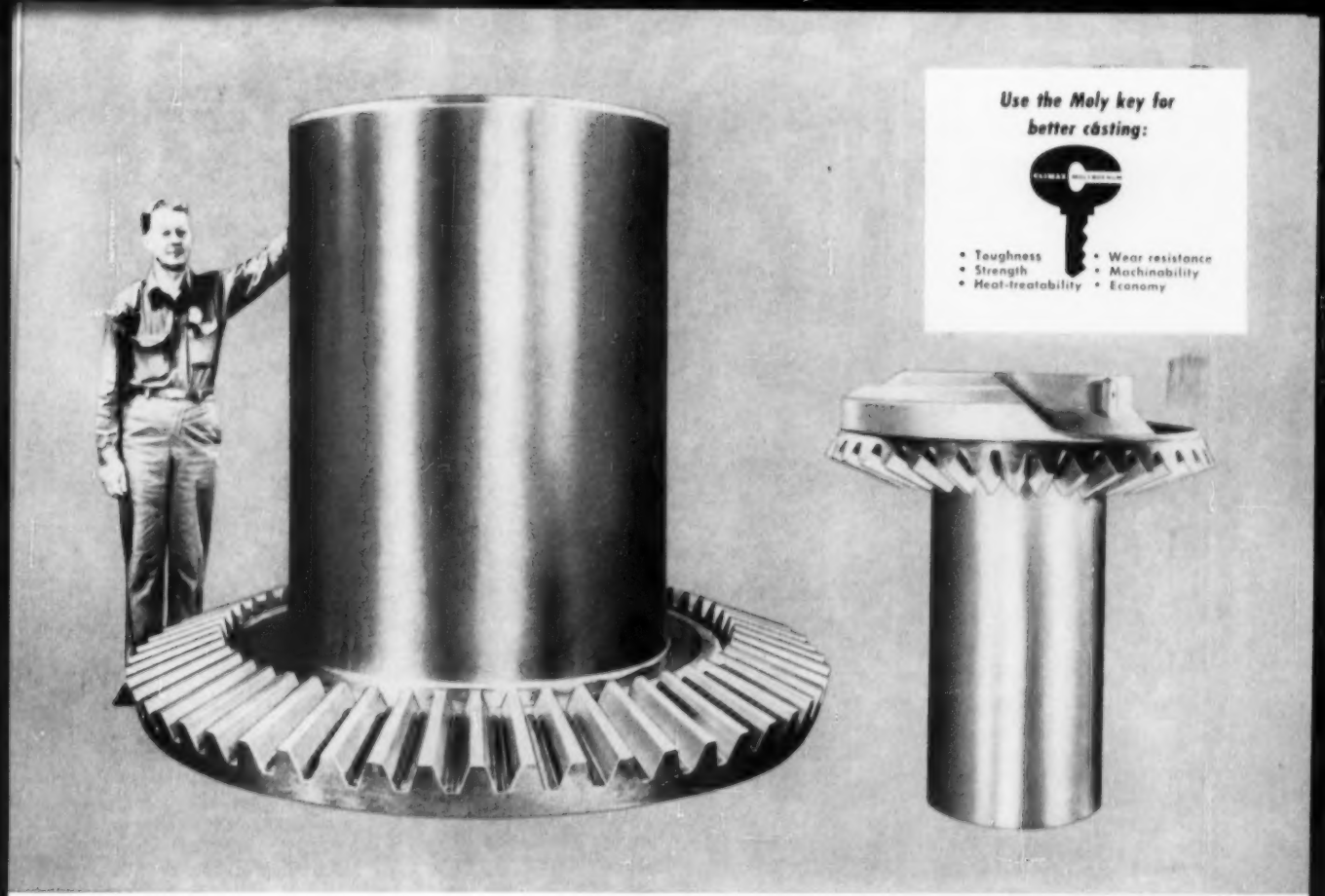


Sage Heavy-Duty Wheel Conveyor

Industrial gravity wheel conveyor is available in 5 and 10-ft straight section and 45° and 90° curves. Side members are heavy-duty 3½ x 1⅜-in. hot-rolled, formed-steel channels, having a capacity of approximately 1500-lb distributed load in 10 ft.

Conveyors are available in widths of 12, 14, 18, and 24 in., with wheel patterns of from 6 to 36 wheels per foot. Axles are spaced on 3-in. centers.

Sage Equipment Co, 50 Essex St, Buffalo 13, NY

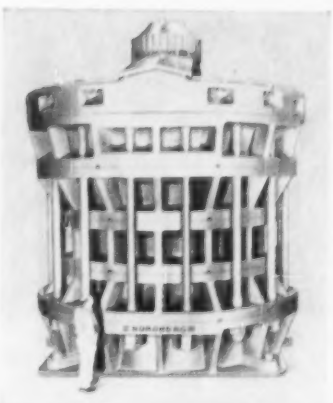


Heavy duty ore crushing machinery is subjected to severe operating conditions. To meet these strenuous requirements the gears shown are made from heat treated low-alloy manganese-*Molybdenum* steel castings. At left: a Symons Gyratory Crusher gear; right: a Symons Cone Crusher gear. Built by Nordberg Mfg. Co.

Cast Manganese Moly Steel contributes strength and toughness to Crushers built by Nordberg

"Where high strength and toughness are prime considerations," says Howard Zoerb, Consulting Engineer of the Nordberg Crusher Division, "molybdenum bearing steels are specified. This is true of the heavy duty parts of Symons® Crushers, built by Nordberg. These steels have contributed to the Nordberg reputation as producers of dependable, heavy duty crushing machinery."

Technical assistance is available to foundries on alloying problems. Please address inquiries on your foundry letterhead to: Climax Molybdenum Company, Department MF, 500 Fifth Avenue, New York 36, New York.



The Symons Cone Crusher is a product of Nordberg Manufacturing Company.

CLIMAX MOLYBDENUM

Diamond Punch Presses Have 35-ton Capacity

No. 3¼ OBI punch presses are open-belt type, have a rated capacity of 35 tons. Specifications include twin-disk air clutch and also air brake, with inching button and controls for single-trip and continuous operation, initiated by remote-control foot-switch or dual pushbutton safety switches.

Diameter of crankshaft at main bearings is 3¼ in. Speed of press is 90 strokes per minute. Size of stroke is 3 in. and ram adjustment 2¼ in. Bolster area is 14 x 25 in. and shut die height is 11 in. Flywheel is equipped with two tapered roller bearings.

Diamond Machine Tool Co, Pico, Calif

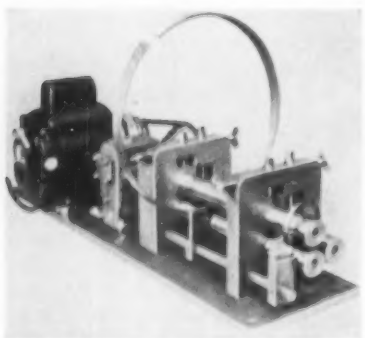
Beko Static Balancers Handle 20-in. Parts

Model 201-VL vertical-spindle static balancing machine (illustrated) has weight capacities of 1 to 20 lb, and will handle diameters up to 20 in. Model 201-VH will handle 5 to 75 lb and diameters up to 20 in. Machines are recommended for balancing impellers, blower wheels, flywheels, fans, pulleys, and other parts having no integral shaft.

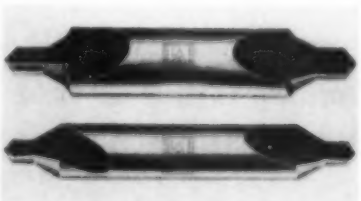
Magnitudes of unbalance are indicated by a large meter, calibrated directly in terms of unbalance-correction procedure selected. Angular positions are pointed out by a stroboscopic lamp.

Dimensions of both machines are the same: 39 in. long, 32 in. wide, and 52 in. high. Balancing speeds range from 700 to 2500 rpm.

Balance Engineering Co, 5030 W Lake St, Chicago 44, Ill



WIRE RING ROLLER will roll rings of round or flat wire, from 2 to 30 in. in diameter. Unit is powered by a ½-hp motor, which will take care of five 3/16-in.-dia wires. Builder reports that machine will do the work of three hand rollers formerly used for this work — *Penn Machinery Co, 117 N Third St, Philadelphia 6, Penna*



Combined Drill-Countersink

Featuring spiral-flute construction, combined drill and countersink tool is available in plain type in sizes 1 to 8 in high-speed or carbon steel, and in bell type, sizes 11 to 18, in high-speed steel.

By careful selection of sizes and by some modification in drill-body diameters, number of sizes has been reduced from 13 to 8, thereby decreasing number of tools necessary for most centering requirements. Diameters of drill sizes range from 3/64 to ¼ in., with length of drill portion equal to that of drill diameter.

Whitman & Barnes, 40600 Plymouth Rd, Plymouth, Mich

DELPARK-JAMESWAY SHUTTLE-TYPE CONVEYOR operates on single level without using second-level requirements. Device operates within trough or trench, in which mechanically or hydraulically operated shuttle drive bar rests on bottom at either side or center. Hinged to drive bar at intervals are blades which open to width of tap as drive bar starts forward movement. Blades advancing with drive bar move material in trough to maximum forward stroke of the drive bar. As movement is reversed, blades fall back against drive bar and bypass material advanced by blade in back. Process is repeated to the advance material in successive steps. Trough and blade widths are in two-inch progressive sizes from 6 to 30 in. Stroke can be adjusted hydraulically to advance fast and return slow or to advance slow and return fast. Portable or permanent installations are possible. Bulletin 110—*Industrial Filtration Co, Dept J-287, Lebanon, Ind*

Aluminum casting alloy designated F132 was developed primarily to replace Alcoa's older automotive-piston alloy, D132, which has a higher nickel content (0.5 to 1.5%, compared to F132's max 0.5%). Maker reports that new pistons operate equally well as old, and that F132 is more dependable material, for an emergency would quickly curtail use of nickel. No apparent dissimilarities have been noted in surface quality, internal soundness, and machinability of the two alloys.

Aluminum Co of America, 7501 Alcoa Bldg, Pittsburgh 19, Penna

All it takes is a local phone call to your Disston distributor. He will give you prompt, personal service from his nearby well-stocked warehouse . . . help you avoid production slowdowns.

YOUR DISSTON DISTRIBUTOR ALSO OFFERS YOU:

Large economies. Your Disston distributor carries a wide inventory of the Disston tools you use regularly. Your purchasing, receiving and bookkeeping procedures are simplified—thus reducing your costs.

Sound advice. Your Disston distributor is a well-informed specialist, having wide experience in solving metal-cutting problems. As a center of information, he can help keep you informed of the latest developments in your field.

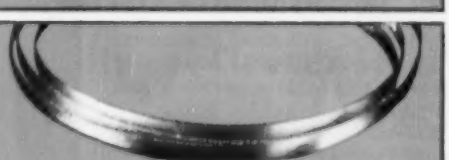
To learn more about the Disston line of fine tools—and how you can profit from using them in your plant—call your local Disston distributor.

Henry DISSTON DIVISION
H. K. PORTER COMPANY, INC.
420 Tacony, Philadelphia 35, Pa.

YOUR DISSTON DISTRIBUTOR STOCKS THESE QUALITY DISSTON TOOLS:

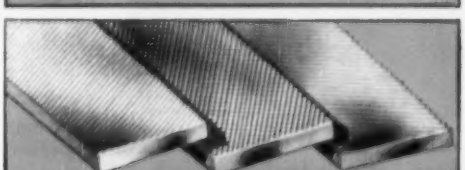
DISSTON HACK SAW BLADES

Sharp, clean-cutting blades for hand and machine use. Blades are carefully milled, accurately set. Wide selection: Super-Safe, High Speed Steel, Di-Mol, Chromol and Duraflex.



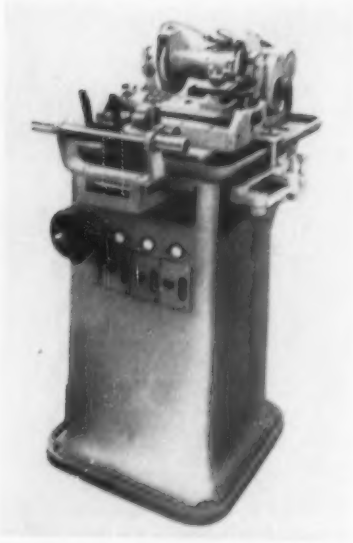
DISSTON METAL CUTTING BAND SAWS

Uniform hardness and temper, durable edges. Made in both Hard Edge Flexible Back and Hardened Throughout styles.



DISSTON FILES

Rugged, long-lasting files for every purpose. Wide selection: exclusive Bite-Rite® American Pattern files, versatile Multi-Metal files and precision-made Superfine® Swiss Pattern files.



Swiss Copy-Grinding Machine Grinds Two Parts at Once

Copyrex copy-grinding machine, produced by S Glasi & Co of Solathurn, Switzerland, permits simultaneous grinding of two duplicate lathe tools, form tools, profile gages, or production parts in one operation.

Copying process is effected through use of a templet, five times enlarged, in conjunction with a parallelogram linkage to the twin toolholders which grip work. Pair of diamond dressers keeps wheels trued for accurate grinding.

Cylindrical grinding attachment which permits grinding of circular pieces up to 4 in. in diameter is also available.

Imported by Carl Hirschmann Co, Inc, 30 Park Ave, Manhasset, N Y

Medium-Size Cleaning Assembly Is Semi-Portable for Bench Work

Model C-375, for use with organic solvents, or detergents, has stainless steel tank measuring 11½ x 8 x 7½ in. with liquid capacity of 3 gal.

Equipment also includes a 375-w RF generator; parts-holding basket; rinse spray nozzle; and combination solvent filtering and recirculation system operated by a ¼-hp electric motor. Filtering is one stage through a replaceable fiber pack that removes all solid material down to 2 microns in size. Newly developed ceramic titanate transducers are incorporated in this model, which operates effectively at 125 C.

McKenna Laboratories, 2503 Main St, Santa Monica, Calif

Heavy-Duty Jigsaw

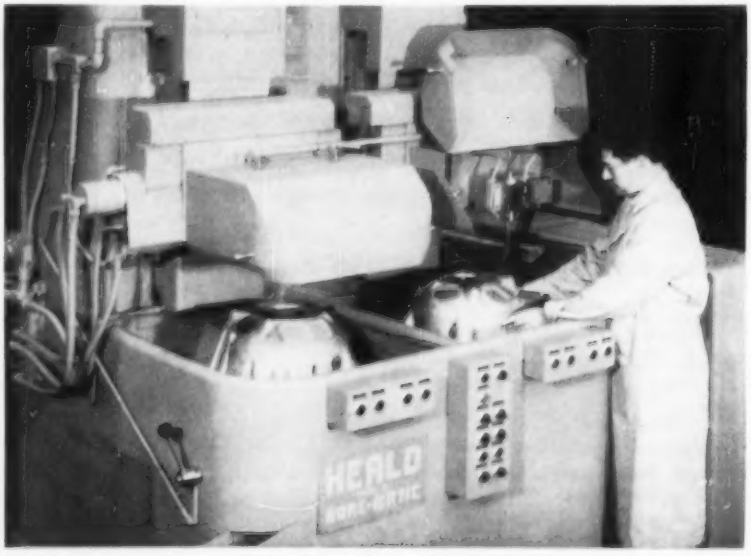
Tool is designed to perform bevel cuts on either side up to 45°. It has a full 1-in. stroke that can cut from a depth of 2 in. at 90° to 1⅜ in. at 45°. Shoe can be adjusted to any angle by calibrated quadrant.

Unit has a special universal motor with power to make straight, curved, sharp radius, and irregular cuts through metal sheets, rods, tubes, plastics, plywood, and glass fiber. Line of cut is blown free of chips by forced air flow. The 6-lb tool is furnished with a metal-cutting blade.

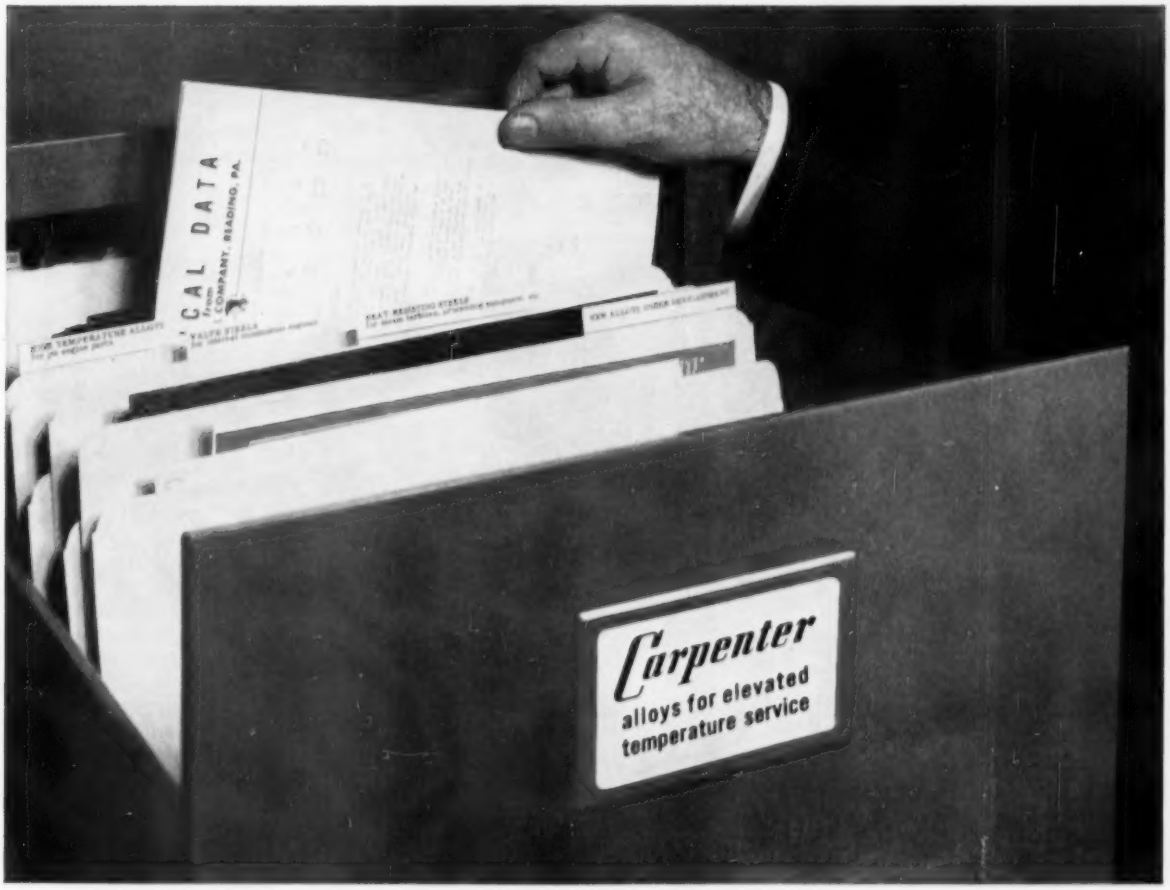
Black & Decker Mfg Co, Towson 4, Md

Low-hydrogen iron-powder electrode, McKay E-716IP, has been added to McKay Co line. Weld metal is reported to be deposited as much as 35% faster than deposition rates obtainable with more conventional low-hydrogen electrodes in company's line. Weld metal deposited is said to have 81,000-psi tensile strength, 69,000-psi yield strength, and 30% elongation in 2 in. Electrode is available in five sizes between ⅛ and ¼ in., and comes packaged in 40 or 50-lb sealed metal containers.

McKay Co, 1005 Liberty Ave, Pittsburgh 22, Penna



TWO-STATION VERTICAL-SLIDE BORE-MATIC has capacity for parts up to 16-in. diameter, and is adaptable to a wide range of work, such as flywheels, impellers, bell housings, and clutch plates. Hydraulically operated slides mounted on base column can accommodate variety of tooling or auxiliary tool-slides. Work is loaded down onto rotating workholding fixtures, which are mounted on vertically positioned Heald precision boring-heads. Heads are driven by individual motors mounted at rear of base. Continuous production can be maintained by loading one station while other is borizing. Unit is shown arranged for performing boring, chamfering, and facing operations on automotive transmission housings; vertical slide movement accomplishes boring and chamfering, and horizontal slide movement generates face—*Heald Machine Co, Worcester 6, Mass*



Discover how these ELEVATED TEMPERATURE ALLOYS can give you

√ Improved Forgeability √ Greater Uniformity √ Cleaner Steels

Exciting possibilities for improvement are ahead when you look into the line of Carpenter alloys for parts or products in elevated temperature service. Here is a line of high temperature and heat-resisting alloys produced in a *specialty* mill. Only a true specialty mill can produce so well these very difficult-to-make alloys.

Here, too, is a combination of unusual advantages not normally found in this type of alloys. For example, Carpenter pioneered the addition of rare earth elements to the analyses of certain grades to give you improved forgeability. And Carpenter's unsurpassed, meticulous quality controls, assure you steels with greater uniformity and extra cleanness to meet the strictest inspection requirements.

Whether you work with one of our present elevated temperature alloys, or a steel produced specifically for your own application, you'll find that Carpenter's wealth of fabricating and working information will help you substantially reduce production costs and get better parts.

Outline your plans or problems to your Carpenter Representative or write direct. You'll get the kind of help that pays off with definite improvements. *The Carpenter Steel Co., 109 W. Bern St., Reading, Pa.*

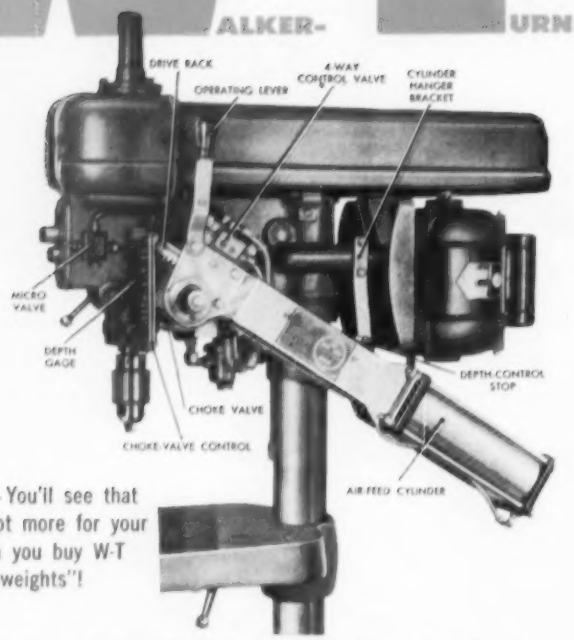
Specify Carpenter alloys for elevated temperature service and get these three big advantages . . .

Improved Forgeability
Greater Uniformity
Cleaner Steel

Carpenter STEEL

Improved Alloys for Elevated Temperature Service

W-T ALKER-TURNER



COMPARE — You'll see that you get a lot more for your money when you buy W-T "Light-Heavyweights"!

You can install this new time-saving, money-saving Air Feed in 10 minutes!

100% PNEUMATIC! NO ELECTRICAL CONNECTIONS! NO MACHINING! Wherever you have repeated drilling and related operations, this new Walker-Turner Air Feed will whittle down your costs and put you in a much better competitive position. It converts any Walker-Turner, or W-T type, Drill Press up to 1" capacity to a high production power-fed drilling machine. Gives sensitive, automatic feed control for a wide variety of production operations in metal or wood. Even short-run jobs are more profitable when you install Air Feed! . . . Air Feed Attachment for 15" and 20" Drill Presses, 4" and 6" spindle travel; prices start at $185. Air Feed-equipped Walker-Turner 15" and 20" Drill Presses, 4" and 6" spindle travel; prices start at $353. . . . Ask your Walker-Turner Distributor to *demonstrate*. He's listed under "Tools" in your phone book's Yellow Pages. Or write today for his name and your new, *free* Manual.

FREE!
New 24-page Manual on application of Air Feed to drill presses

DRILL PRESSES, HAND AND POWER FEED — AIR FEED DRILL PRESS ATTACHMENT — RADIAL DRILLS — WOOD AND METAL CUTTING BAND SAWS — TILTING ARBOR SAWS — RADIAL SAWS — JIG SAWS — CUT-OFF SAWS — LATHES — SPINDLE SHAPERS — JOINTERS — BELT AND DISC SURFACERS — FLEXIBLE SHAFT MACHINES

walker-turner

WALKER-TURNER
Division
Kearney And Trecker Corporation • Plainfield, N. J.

HIGH-SPEED-STEEL HOLE SAWS in Milford line are said to cut clean holes in virtually any machinable metal. Welded-edge blade construction is used, with 6 teeth per in. and a cutting depth of 1⅛ in. Saws may be used in lathe tailstocks as well as air or electric drills and drillpresses—*Henry G Thompson & Son Co, New Haven, Conn*

Electric Motor Wheel

Dever motor wheel combines an electric motor within a wheel to make a compact, integral driving unit. Motor runs on ac or dc from either generator or battery. On model shown, power source is 24v dc; 35-lb portable model can pull 3000 lb up to 15 min continuous duty. Larger models have proportionately greater load capacities.

Among advantages claimed for motor wheel is increased delivery of power per given input of energy directly to wheel or rotating part, since it occupies unused space be-

tween hub and wheel rim with minimum friction loss. Total horsepower potential is delivered directly at point of driving contact. Since both armature and field counter-rotate, gear horsepower output is more than twice that of common applications.

Management Directions, Inc, 8681 Wilshire Blvd, Beverly Hills, Calif

Automatic Flood Light Operates Electronically

Lite-O-Matic Model SJ, plugged into standard outlet, goes on instantly when it gets dark, shuts off automatically at daybreak.

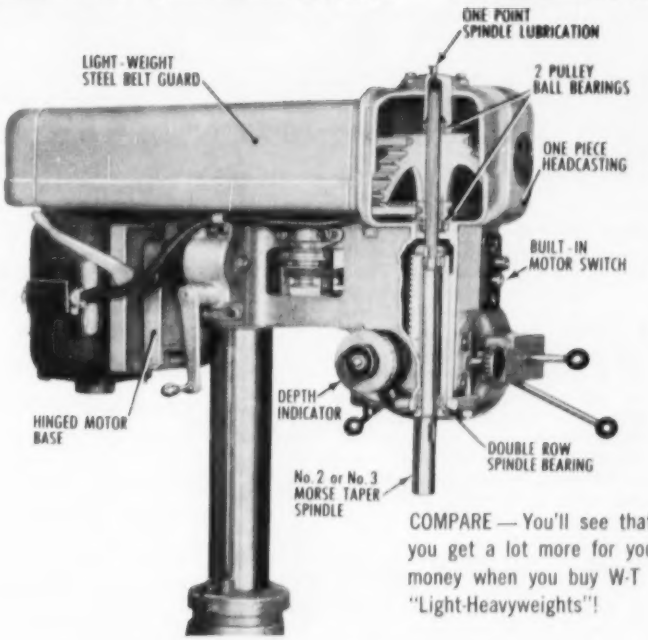
Unit, mountable in any position, protects a minumum area of 10,000 sq ft. Operational cost is approximately two cents per day, price is $34.50.

Lite-O-Matic Co, 2271 E 14th St, Brooklyn 29, NY

Wheeled Jack Attaches To Steel Platform

Norwood materials handler consists of platform section mounted on two wheels and two legs, to which can be attached a wheeled jack and steering handle for movement from one location to another. Jack engages a fitting at the leg end of the

W-T ALKER-TURNER



COMPARE — You'll see that you get a lot more for your money when you buy W-T "Light-Heavyweights"!

Here's the inside story of fast, accurate production!

The features you see here add up to unusually fine engineering — the kind you normally find only on heavy, expensive drill presses. But Walker-Turner's 20" press gives you the combination you want — high production rate, at low initial cost.

You can have this W-T 20" Drill Press with hand feed, power feed or the new W-T Air Feed — in bench or floor models; you can set it up in any number of multiple spindles.

1100 Series — Walker-Turner "LIGHT-HEAVYWEIGHT" 20" Drill Press: 6" spindle travel. 10 spline manganese steel spindle. Unusually wide range of speeds — 260 to 2600 rpm, with 1140 rpm motor. Capacity to 1" in cast iron.

Ask your Walker-Turner Distributor to show you what this husky drill press can do for you. He's listed under "Tools" in your phone book's Yellow Pages. Or write for his name and we'll send full descriptions.

DRILL PRESSES, HAND AND POWER FEED — AIR FEED DRILL PRESS ATTACHMENT — RADIAL DRILLS — WOOD AND METAL CUTTING BAND SAWS — TILTING ARBOR SAWS — RADIAL SAWS — JIG SAWS — CUT-OFF SAWS — LATHES — SPINDLE SHAPERS — JOINTERS — BELT AND DISC SURFACERS — FLEXIBLE SHAFT MACHINES

walker-Turner

WALKER-TURNER
Division
Kearney And Trecker Corporation • Plainfield, N. J.

WIN $2000.00
IN THE WENDT-SONIS
TOOL HOLDER
"CUT COSTS" CONTEST

New! Different! Interesting! Easy too . . . and you win two ways in the Wendt-Sonis "Cut Costs" Contest. Who's eligible? Anyone employed by a company using the new superior Wendt-Sonis tool holder for throw-away inserts — a proven cost cutter. Keep a record on how you did it — how you "cut costs." Enter the facts on a simple-to-fill-out entry blank — send it to Wendt-Sonis Company for a chance at the prizes. Contest closes June 30, 1956. You win two ways — a chance at the prize — your job done at lower cost with Wendt-Sonis tool holders for throw-away inserts.

briefly — here's all you do . . .

1. Use the coupon below to get your entry blank and clear-cut easy-to-understand contest rules.
2. Be sure you have Wendt-Sonis tool holders for throw-away inserts on your job.
3. Jot down the facts and figures on the job for filling in the standard entry blank. You can base your example on lower tooling costs . . . less downtime . . . more parts per hour . . . *all* of these three . . . or any other savings you accomplished with Wendt-Sonis tool holders for throw-away inserts. Don't worry about neatness, spelling or size and type of job. Enter more than one job if you wish!

Don't be concerned about our using your name or company name in advertising. We wouldn't do that without getting your permission first.

$5000.00 IN PRIZES

1st $2000.00
2nd $1000.00
3rd $ 500.00
4th $ 250.00
and 25 $50 PRIZES
for
DOING YOUR JOB BETTER . . . AT LOWER COST

CONTEST JUDGES

John Greve
Executive Editor
Tool Engineer

Jerome S. Wilford
Executive Editor
Production Magazine

Elmer J. Tangerman
Executive Editor
American Machinist

GET YOUR SIMPLIFIED ENTRY BLANK RUSH!

CLIP — mail now!

"Cut Costs" Contest
Wendt-Sonis Co.
Dept. AM-456, Hannibal, Mo.

I want a chance to win in the Wendt-Sonis Tool Holder "Cut Costs" Contest. Rush me rules and entry blank.

COUNT ME IN!

NAME _____ POSITION _____

FIRM _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

platform, lifts that end, and converts the stable unit into a wheel-mounted assembly for free movements. A number of the platforms can be employed with one wheeled jack.

Platform dimensions range from 24 to 50 in. in width and from 36 to 130 in. in length. Semi-steel, rubber-tired, or plastic wheels can be supplied. Hyatt roller bearings, pressure lubricated, are standard equipment. A power lift jack is available to specifications.

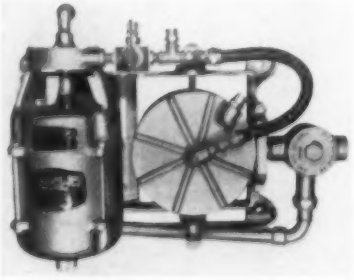
Norwood Tool & Machine Co, Three Rivers, Mich

Magnetic Counter Has Lock Key

Designed for panel mounting where remote indication is required, unit has capacity of 1000 counts per minute. Tumbler lock prevents tampering; single turn of the key resets all six figures to zero.

Model is 5.11 in. wide, 2.10 high, 1.68 deep; power consumption is 8 w. Available in 110 and 220 ac and dc; Series 1205, ac; Series 1248, dc.

Veeder-Root Inc, Hartford 2, Conn



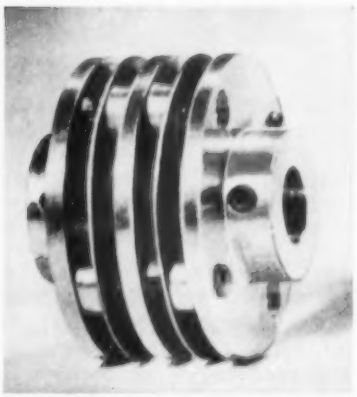
Hot Spray Unit Developed For Frequent Color Changes

Circaflo Special, a maintenance-free unit with coil-less heat exchanger and centrifugal pump, incorporates a new quick-change color selector system.

Selector valve is combined with a Spee-Flo heater for an installation requiring frequent color changes, as well as for continuous-duty single

color operation. Clean-out and color change reportedly takes less than a minute.

Spec-Flo Co, 720 Polk Ave, Houston, Texas

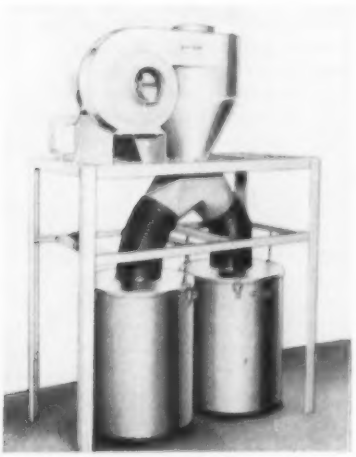


Oerlikon Flexible Coupling

C-300 coupling serves for precise, backlash-free transmission of rotation between shafts, and is available for shaft diameters between ⅛ and 5/16 in. Angular misalignments of up to 6° can be accommodated by the coupling.

Coupling features three disks, mounted between the two hub flanges, with two setscrews on each hub for attachment to shafts.

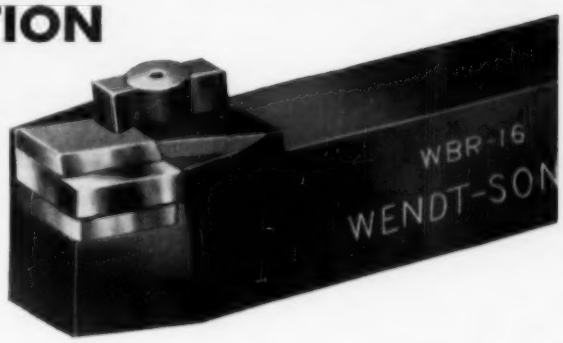
Oerlikon Tool & Arms Corp of America, Box 3049, Asheville, NC



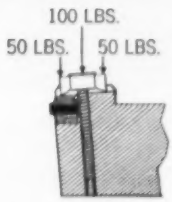
Dust Collector for Outside Air Exhaust

Dustkop Model 11NW50 dust collector is specifically designed for outside air exhaust, where the application of recirculating air collectors is

SUPERIOR CLAMPING ACTION

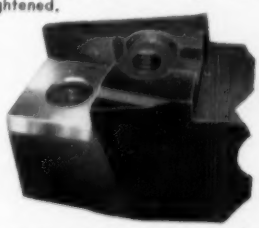


with WENDT-SONIS TOOL HOLDERS for Throw-Away Inserts



Exclusive Wendt-Sonis clamp evenly distributes force on insert and tool body . . . holds insert more securely. Clamp or screw will not distort when tightened. Also clamp is recessed in holder body to prevent twisting when tightened.

Replaceable Carbide Shim. Insert rests on a replaceable carbide shim. Shim protects tool body from damage in event of machine or insert failure, reduces wear and chatter and gives maximum insert support.



SIMPLICITY. Only 5 separate parts. Only one screw is loosened to index insert, or add chipbreaker. Screw has socket head in both ends.

GREATER STRENGTH. Holder body is hardened steel. Clamp is forged steel held by large clamp screw. Insert is "nested" so that all cutting forces are transmitted to holder body.

A COMPLETE LINE. Wendt-Sonis Standard and Special Mechanical Tool Holders are available for almost all operations, both right or left hand cutting. Shank sizes range from ½" square thru 1" x 1½". Holders with neutral, negative or positive rakes are available. Inserts are either precision or utility ground.

WENDT-SONIS COMPANY

HANNIBAL, MISSOURI, Dept. AM-456, ROGERS, ARKANSAS

Spincraft did it for General Mills

Spincraft can do it for you!

Spun spheres protect mechanical fingers of world's toughest recorder

another example of Spincraft's "start-to-finish" fabrication

15 Different Operations —

The sphere, protecting the delicate sensing instruments, is completely fabricated by Spincraft. The sphere consists of an outer steel and inner aluminum shell separated by insulating material. The two hemispheres are joined together by an ingenious locking and sealing arrangement. Spincraft's complete fabricating responsibility involved spinning, machining, arc-welding, spot welding, brazing, grinding, sawing, drilling, braking, stamping, phosphate plating, anodizing, painting, assembly and pressure testing. Craftsman (above) is shown assembling a Flight Recorder.

This aircraft Flight Recorder, manufactured by the Mechanical Division of General Mills, etches a continuous 300-hour record of heading, air speed, vertical acceleration and altitude on aluminum foil. Each Recorder is fully-enclosed and protected in a specially fabricated sphere — made by Spincraft. The recording device, when enclosed in the sphere, is designed to withstand shocks of 100G's and resist temperatures of 2000°F up to 30 minutes.

This is another example of Spincraft's versatility and manufacturing skill. We offer complete facilities for contract manufacture of finished parts, assemblies and complete products.

Take advantage of our modern tools for spinning, deep drawing and stamping as well as complete fabrication. They can pay off in savings for you.

Write for Spincraft data book. If you have a specific problem, tell us about it — no obligation.

WORKSHOP OF AMERICAN INDUSTRY SINCE 1919

World's largest plant fully equipped for all types of metal spinning • deep drawing • stamping • fabricating

Spincraft

SKILL WILL DO IT

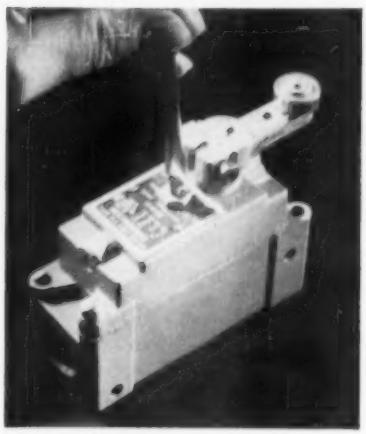
INCORPORATED

4136 WEST STATE STREET • MILWAUKEE 8, WISCONSIN

not practicable. Unit is also adaptable for installations where toxic fumes, obnoxious odors, or smoke, as well as dust, accompany operations. Collector does not remove fume or odor from the air, but merely exhausts it through a pipe connected to an outlet collar at the top of company's Cyclone Separator.

Unit has framework of welded angle iron and dust drums of heavily reinforced sheet metal. Unloading maintenance is simplified by use of a wire-reinforced neoprene flexible hose which connects to the rubber-castered storage cans individually, and to the collector by a "Y" which diverts flow of dust to one can while other is being removed for dumping.

Aget Mfg Co, Adrian, Mich



LIMIT SWITCHES for machine-tool and general-purpose applications are offered by Westinghouse in two types: Type PLS lever-operated switch (illustrated) may be adapted for clockwise, counterclockwise, or universal operation by turn of a screw selector; Type PRS switch is actuated by depressing a push-rod. Both switches are available for flush or projection mounting and both have identical electrical characteristics: normal ac current ratings range from 15 amp at 115v to 5 amp at 600v; max dc current ratings range from 2 amp at 115v to 0.1 amp at 600v—*Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Penna*

Heavy-duty cylinders, known as Ultra-mation, are non-rotating, double-acting, square-end. Furnished in five bore sizes from 2 to 6 in.; pressures to 150 psi air, 500 psi oil; five basic mounting styles: foot, trunnion, flange, clevis, pivot. Catalog 100-5-1.

Logansport Machine Co, Logansport, Ind

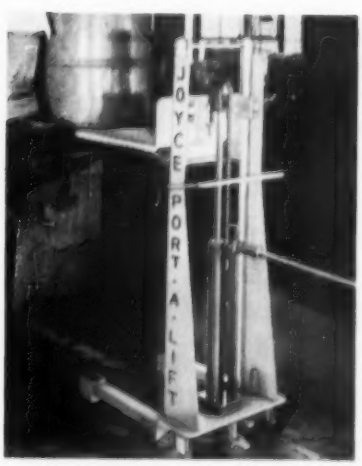
Noblewest Hand Type Holders Have Interchangeable Type

Line of hand type holders designated Nobility accommodates interchangeable steel type for random setup of part numbers, heat codes, date codes, and similar codes for the hand stamping of castings, forgings, and machine parts. Entire impression can be made with one hammer blow.

Made of alloy steel, frame is heat treated for long life and the elimination of spawling. Holder is equipped with a removable, hardened seat and an oversize socket-head cap screw which clamps the type firmly in place.

Line includes standard holders for type sizes of 1/16, 3/32, and ⅛ in. Various type capacities range from 4 to 15 pieces.

Noble & Westbrook Mfg Co, East Hartford, Conn



Hydraulic Lift

Joyce Port-A-Lift can be used for wide variety of loading and unloading operations; unit is of lightweight

Built into your equipment

BIJUR

AUTOMATIC LUBRICATION ASSURES SATISFACTION

you benefit 5 ways

- Increase Production Capacity
- Save on Repair Bills
- Eliminate Costly Hand Oiling
- Reduce Downtime
- Lengthen Machine Life

WITH Bijur Automatic Lubrication as an integral part of your machines, you benefit from continuous peak production. Plant after plant reports increased out-put and greatly reduced maintenance costs with Bijur-equipped machines. Costly downtime for lubricating by hand is eliminated. Every bearing is metered the proper quantity of oil at predetermined intervals. Work spoilage and bearing troubles caused by over-lubrication are avoided. Fire hazards are reduced. Personnel accidents are prevented.

More than a million Bijur-protected machines are currently in use. Hundreds of leading manufacturers standardize on Bijur as "built-in" components of their machines. Bijur emphasizes custom engineering, and will gladly cooperate with your machine builder in designing a lubricating system to meet the specific requirements of the machines you order.

Bijur designed into your machines now automatically assures satisfaction. It makes sense . . . and dollars, too! Why not write today for literature and engineering information?

BIJUR
LUBRICATING CORPORATION
Rochelle Park, New Jersey
Pioneers in Automatic Lubrication

4136 WEST STATE STREET • MILWAUKEE 8, WISCONSIN

KORFUND
VIBRATION CONTROL

lets you Line 'em up for more Production *Profits*

The goal of every production man is to have a "straight-line" flow of work on his line. It saves time, increases production, which in turn increases profits. Korfund has helped many production men achieve this goal by making it possible to rearrange production lines rapidly to meet the requirements of each run.

You can move machines like this grinder around with a minimum of difficulty and down time. Mounted on Korfund LEV-ELASTO Dampers as shown above or VIBRO-ISOLATORS, they stay put without lagging—no "creep". The adjustable leveling screws eliminate shims, make installation simple. And, as an added plus, the Dampers protect the machine from transmitted vibration that can cause rejects.

Of course, all our installations are not as simple as this—in some cases, tremendous weights are involved, or vibration problems are critical, or both. In these cases production engineers are enthusiastic about Korfund Steel Spring Vibro-Isolators.

Solving vibration control and machinery mounting problems is Korfund's specialty. We have more than a half-century of experience in the field. Our experience lets us recommend "the right way the first time"—no trial-and-error basis is necessary.

Reserve your copy of the booklet "So You Want to Increase Production," coming soon. Write for Bulletin 30.

For specific recommendations contact us or one of the 46 local Korfund offices. Look under "Korfund" in your local Telephone Directory or in Thomas' Register.

THE KORFUND CO., INC.

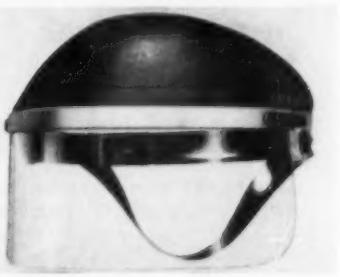
KORFUND VIBRATION CONTROL — SPRINGS — RUBBER — CORK

48-39B Thirty Second Place, Long Island City 1, N. Y.
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

welded-steel construction. Non-skid platform of 24 x 24-in. size is designed to handle bulk or palletized material. Four factory-lubricated needle-bearing rollers provide effortless lifting.

Lift is powered by Joyce Power Prince hydraulic jacking unit. A foot brake located directly under the jacking unit prevents lift from moving while being loaded or unloaded. Capacity of lift is ½ ton.

Joyce-Cridland Co, Dayton, Ohio



All-Purpose Face Shield

Cesco 770 face shield comes in three window lengths of 4, 6, and 8 in., measured from top to bottom. Windows mount inside an aluminum channel in a tight assembly which is impervious to entrance of dirt or liquid.

Headband of vinyl plastic is completely flexible, and is adjusted by a sliding strap. Windows are of cellulose-acetate, and may be obtained in green or clear.

Chicago Eye Shield Co, Chicago, Ill

"Do It Yourself" Press

All components in Owatonna 17½-ton press are knocked down and shipped ready for buyer to put together. Buyer has only to drill prick-punched holes, paint, and assemble. Press design and materials are same

buy your oven furnace "off the shelf"

It's as easy to buy the exact oven furnace you need from 'Surface' as it is to buy a new hat. Hundreds of customers have picked "off the shelf" standardized furnaces which they'd assumed would have to be engineered from scratch. Naturally, they saved money because their engineering costs were spread over hundreds of 'Surface' standard units.

Temperature ranges in large oven furnaces are 600°F to 2500°F. Double end doors can be supplied for straight-through operation. Accessories, handling devices, and quenching equipment can be incorporated with any degree of mechanization required.

And whatever furnace you choose from this whole, wide range, you get the well-known 'Surface' burner equipment with one-valve control, automatically correct air-gas ratios, and wide turndown range.

write today for Bulletin H55-6

Surface
HEAT TREATING EQUIPMENT

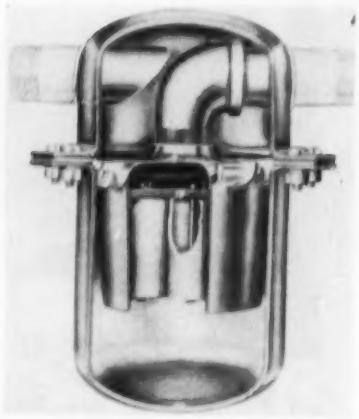
SURFACE COMBUSTION CORPORATION, TOLEDO 1, OHIO

as in company's Y106-A Power-Twin standard press.

Press is 58 in. high, 23½ in. wide, and requires floor space of 28 x 27½ in. Width between uprights is 20 in. and between table channels 5 in.; distance between adjusting holes is 3⅜ in. Weight of press is only 180 lb.

Available as optional equipment is OTC Power-Twin hydraulic power head. Unit can be removed from press and used with pulling sets if desired.

Owatonna Tool Co, Owatonna, Minn



High-Flow Industrial Filter

Arrow filter is designed for bulk handling of liquids, gases, chemicals, oils, and compressible fluids. Built in any size, unit is reported to provide efficient filtration with low pressure drop.

Porous bronze, cleanable filter element can be furnished for filtering out solids from 80 microns down to 6.5 microns. Company engineers will furnish filter specifications from data supplied by inquirer on degree of filtration required, type of liquid or gas to be filtered, flow required in gpm, and maximum operating pressure and pipe-line inlet and outlet diameters.

Arrow Tools, Inc, 1996 S. Kostner Ave, Chicago 23, Ill

Strippable plastic coating, called MetalGuard, for protection of smooth, or highly polished surfaces, is sprayed on, quickly dries to a tough, clear film that reportedly withstands all manufacturing operations. Product has tensile strength of more than 2500 psi, and elongation up to 200%.

Guard Coatings Corp, 8-05 43rd Ave, Long Island City NY

NOW YOU CAN REALLY
PUT THROW-AWAY INSERT ECONOMY AND EFFICIENCY TO WORK

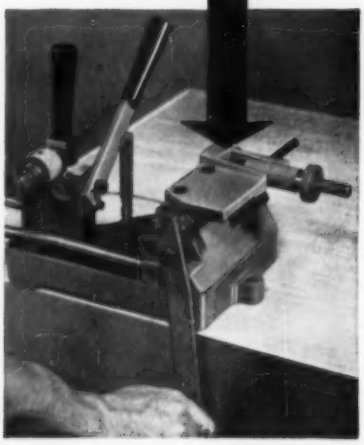
VALENITE
insert tooling offers you—

- **MORE STYLES—the most complete line of holders and inserts . . . in stock.**
- **ADAPTABILITY—you can combine a large variety of standard elements to make up specialized tooling to fit your requirements exactly.**
- **VARIABLE INSERT THICKNESS—Four grades, four styles, each available in three thicknesses. Fit any holder, any assignment.**
- **NEW complete, Holder and Insert Catalog — biggest book ever devoted to throw-away holders and inserts.**

Write for Catalog—A-5.

VALENITE
METALS CORPORATION
Box 205 • Royal Oak, Mich.

make Springs in Seconds!



Save Costly Special Orders With the NEW

DI-ACRO* Spring Winder

This unique machine eliminates costly special spring orders, saves valuable waiting time. Winds flat, torsion, compression and extension springs to 1½" O.D. Handles round, flat and rectangular wire to ⅛" dimension. Note exclusive features in the hand operated Di-Acro Spring Winder which assure accurate tension and fast operation without special experience or skill.

new **TENSION CONTROL**—Simply adjust to desired tension—the control keeps it uniform, for winding one spring or hundreds, and releases when each spring is wound.

new **WIRE CUT-OFF**—After spring is wound, release tension and use cut-off lever to quickly cut end of spring to desired length.

new **CAM LOCK**—Simply feed wire under cam, turn handle and wire is securely locked to arbor while spring is wound. No threading required.

FREE ENGINEERING SERVICE

Extension Compression Right Hand Left Hand Torsion

Send us your spring forming problems — samples or dimension sketches—together with sufficient test material, and let us wind some sample springs for you free of charge. No obligation.

32-Page Catalog gives complete details on all Di-Acro Precision Machines—Spring Winders, Benders, Brakes, Shears, Press Brakes, Punch Presses, Notchers, Rod Parters, Rollers.

*pronounced Die-ack-ro

O'NEIL-IRWIN MFG. CO.
311 8th Ave.
Lake City, Minn.

di-acro PRECISION METALWORKING MACHINES

SIP

Guaranteed Accuracy

More and more manufacturers apply SIP *Guaranteed* Accuracy to define, establish and maintain high precision in production and measurement to improve quality-of-output and economy-of-operation.

GEROTOR MAY CORPORATION

W. H. NICHOLS COMPANY

REPUBLIC AVIATION

HUGHES AIRCRAFT COMPANY CULVER CITY, CALIFORNIA

FORD

Honeywell

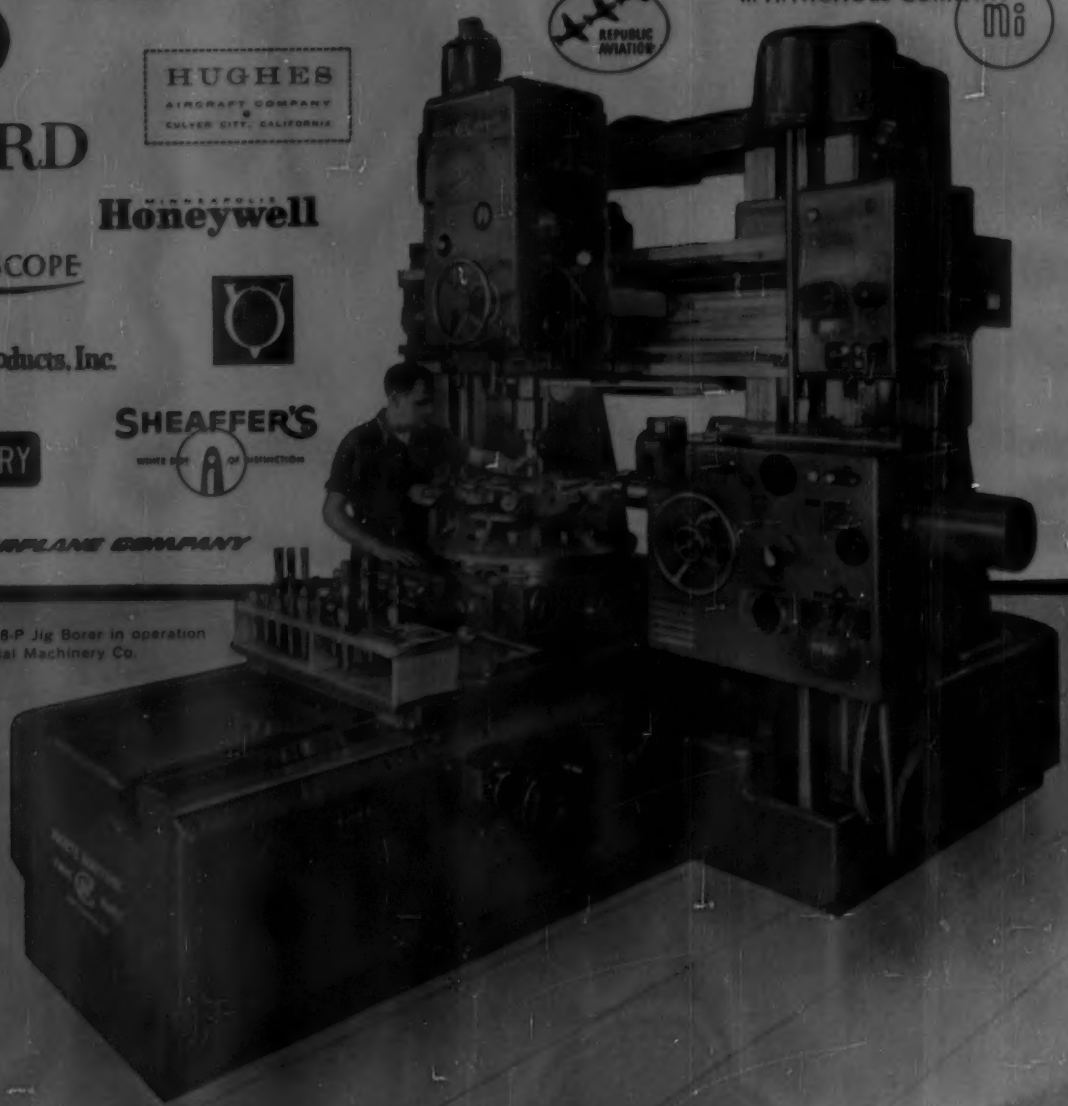
LIBRASCOPE

Thompson Products, Inc.

SHEAFFER'S

KINGSBURY

BOEING AIRPLANE COMPANY



SIP HYDROPTIC 8-P Jig Borer in operation at Hartford Special Machinery Co.

AMERICAN SIP CORPORATION

HIGH PRECISION MACHINE TOOLS & MEASURING EQUIPMENT

100 EAST 42nd STREET, NEW YORK 17, N. Y.

A. Louis Oresman, President of Catalina, Inc., asks

"Can you pick the winner?"

"The bathing suit business is like a beauty contest. You never can tell in advance which models are going to win!

"This year, for example, we designed more than 400 different suits. Those that catch on in the stores get a flood of rush orders! They push our production facilities to the utmost. And that, in turn, puts the pressure on shipping and delivery.

"But even though our manufacturing is done in the Los Angeles area, we never have delivery problems anywhere in the 48 states! They're all solved for us by Air Express! And Air Express has never failed us!

"Using Air Express regularly, we can fill rush orders anywhere in the country in a matter of hours. And in the highly competitive fashion business, that's important!

"And yet, most of our shipments cost less than any other air service. 10 lbs., for instance, Los Angeles to Dallas, is $5.70. It's the lowest-priced complete air service by 81¢!"

Air Express

GETS THERE FIRST *via U.S. Scheduled Airlines*

CALL AIR EXPRESS . . . *division of* RAILWAY EXPRESS AGENCY

Nu-Aero penetrating oil with molybdenum disulfide is available in an aerosol dispenser. Product, which loosens and lubricates even under extreme conditions, leaves a film that is said to be impervious to heat or pressure.

Pressure Products Co, West Chester, Penna

Lubricant additive, designated Hyperoil, is completely non-corrosive, is said to have extremely high penetrating qualities, excellent rust-preventive and metal preservative qualities. Product, with exceptionally low limits of flammability, can be applied with grease lubricants or in concentrated form to electrical motive power devices.

Destiny Products Co, 2970 W Grand Blvd. Detroit 2, Mich

Plastic acid-etch marking stamps are available in four styles: peg; dowel; key-chain dowel; and pocket-clip. The last three have special cap and self-contained ink pad. Any lettering, design, or combinations of special symbols can be used on the stamps.

Jas H Matthews & Co, 3982 Forbes St, Pittsburgh 13, Penna

Bending brake, called Bendit, Jr, for bending, forming, or shaping, fits any machinist's vise with jaws up to 4½-in. width. Processes cold rolled steel or equivalent, 18 gage, up to 6 in. wide. Weight, 7 lb; price, $12.95.

Lund Mfg Co, Biddleford, Maine

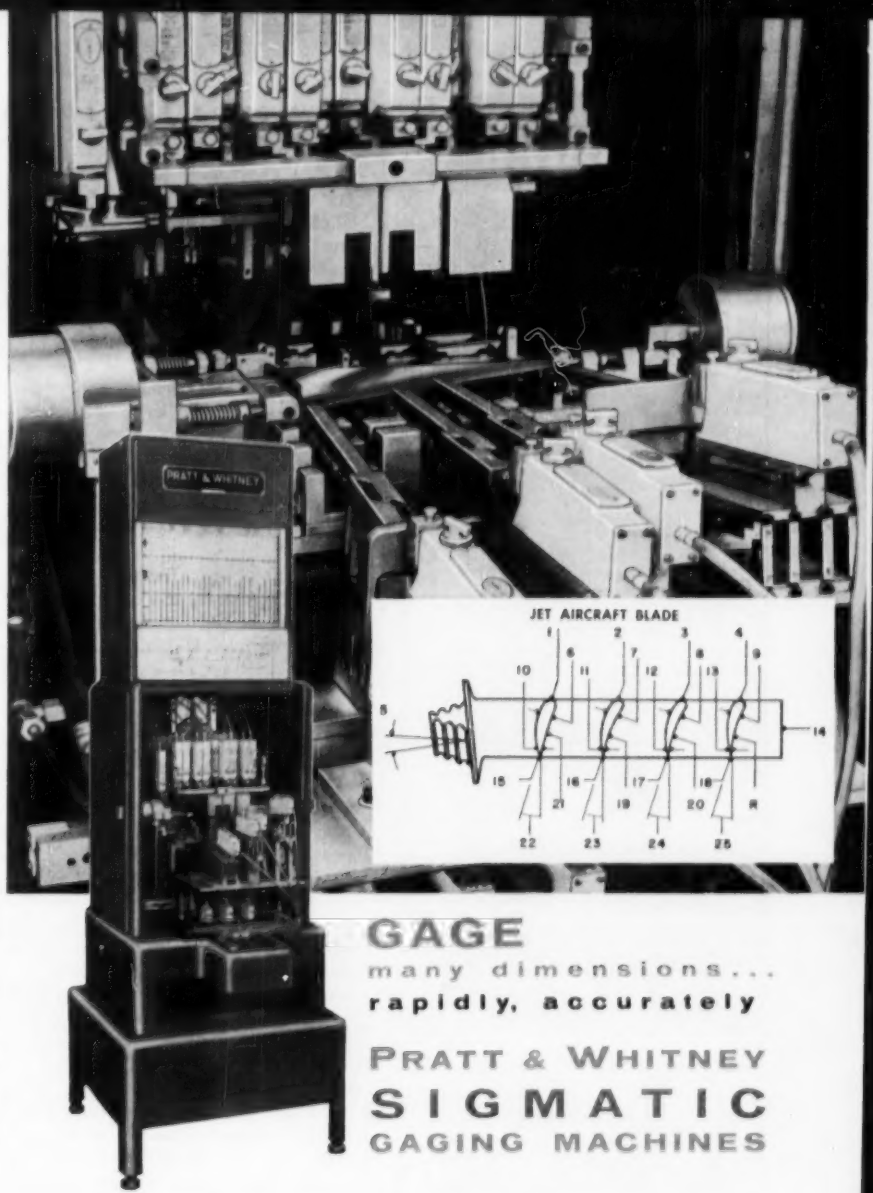
Everready safety flashlight is designed to prevent a broken bulb from touching off explosive mixtures in gaseous atmospheres. Triggered reflector unit molded of Bakelite phenolic plastic acts like a circuit breaker. Spring-loaded contact in reflector snaps a wire guard over the lamp and cuts off current if bulb breaks in an accidental fall.

National Carbon Co, Division of Union Carbide & Carbon Corp, 30 E 42nd St, New York 17, NY

Kit of Cratex Rubberized Abrasives for deburring, smoothing, and polishing operations contains an assortment of 24 polishing wheels, cones, blocks, and mandrels. Price is $12.50.

Cratex Manufacturing Co, 81 Natoma St, San Francisco, Calif

Miccrosol Spray S-2003, a 100% sprayable plastisol, requires no thin-



GAGE
many dimensions...
rapidly, accurately
PRATT & WHITNEY
SIGMATIC
GAGING MACHINES

25 CRITICAL DIMENSIONS of jet engine compressor blades are checked simultaneously on this P&W, Semi-Automatic Type, SIGMATIC Gaging Machine. Gaging is fast (up to 350 blades per hour), low in cost and dependably accurate. By contrast, separate gaging of each dimension would be slow, prohibitively expensive, and subject to the element of human error.

Like all SIGMATIC Gages, this machine is versatile . . . able to check several different blade sizes by means of interchangeable gage tooling; changeover takes only about 30 minutes.

For large or small production runs . . . for in-process gaging or final inspection . . . *wherever* many dimensions of complex parts must be closely controlled, P&W SIGMATIC Gaging provides the practical, low cost answer. Use the coupon on the facing page to send for complete information; there's a machine *right* for your needs.

PRATT & WHITNEY COMPANY
INCORPORATED
11 Charter Oak Boulevard, West Hartford 1, Connecticut
Direct Factory Representatives in Principal Cities
MACHINE TOOLS • GAGES • CUTTING TOOLS

See how
LINDNER
JIG BORER
direct-reading
micro-optical
measuring system
with "Autopositioner"

speeds initial and repeat table settings-guaranteed accurate within .00015"

readings in .00005" no gauges, blocks or bars

table sizes
44" x 24"
32" x 16"

SEND for 25-minute movie film demonstration

KURT ORBAN
COMPANY, INC.
36 Exchange Place
Jersey City 2, N. J.
In Canada:
2490 Eglinton Ave. W. Toronto

ner or solvents. Non-porous film of 60 mils thickness can be applied in one application without sagging of material.

Michigan Chrome & Chemical Co, 8615 Grinnell Ave, Detroit 13, Mich

Self-locking pin, Type U Driv-Lok, designed for hopper feeding and/or insertion in a drilled hole, has a pilot on each end for fast insertion, and easy, accurate starting of either end of pin. Available in wide range of sizes and materials.

Driv-Lok Pin Co, Sycamore, Ill

E-6013 electrode, Fleetweld 37, is an all-position unit for ac or dc current. Features include excellent arc stability; arc is soft and smooth; handles poor fit-up; makes clean, smooth edge and corner welds. Available in ⅛, 5/32, and 3/16-in. sizes.

Lincoln Electric Co, Cleveland 17, Ohio

Series 42X tachometer made by Metron not only indicates speed, but actuates self-contained power relays that signal overspeeds and underspeeds. Instrument can be used in sounding alarms, turning on light signals, stopping or starting equipment, controlling speeds. High and low limit points are independently adjustable; these pointers act as a single-pole, double throw switch, with the regular speed pointer acting as the switch center arm. Manual reset pushbutton is used to reset tachometer after the relays have signalled a high or low speed. Device is available with any one of 48 scales, marked in any rate such as rpm, fpm, or sheets/hour.

Metron Instrument Co, 432 Lincoln St, Denver 3, Colo

Low-hydrogen arc-welding electrode, Rocket LH, incorporates iron powder in the coating, reportedly improving stability of the arc and minimizing shorting out. Electrode is packaged in sealed cans and has a natural resistance to moisture for at least ten days after can is opened. Electrode is available in five grades and in sizes ⅛, 5/32, 3/16, 7/32, and ¼ in.

Hobart Brothers Co, Hobart Sq, Troy, Ohio

Dry lubrication process, Useco-Lube, is available for application to metallic surfaces where oils and greases are not feasible or desirable. Lubricant impregnates and film-coats surface and leaves no surface build-up. Impregnation into the metal pores is reported to assure the presence of the lubricant even after prolonged wear. Process is said to provide effective lubrication at temperatures ranging from –30F to 800F.

U S Engineering Co, 14550 Lesure Ave, Detroit 27, Mich

Transparent lacquer, Pyroxcote No. 26-105, for aluminum frames, siding, doors, etc, is designed for protection against weathering, corrosion, and pitting. May also be used as weather-resisting coating on brass, bronze, steel; applied by spray gun, dip tank, brushing, flow coating, or rollers.

Pyroxylin Products Inc, Chicago, Ill

High heat paint, designed to protect surfaces subjected to temps up to 750 F, is designated as HSE (hot surface elastic) Black. It is said to dry to a smooth finish in 8 to 10 hrs, does not require special baking for effectiveness. Applied by brush or spray.

Speco, Inc, 7308 Associate Ave, Cleveland 9, Ohio

Marking paint stick, called Markal D-A, is for products subject to acid and alkali conditions. Said to be permanent, weatherproof, and fadeproof, markings withstand temps up to 500 F. Available in colors.

Markal Co, 3052 W Carroll Ave, Chicago 12, Ill

Pushbutton actuators for snap-action switches, designated 4MA and 5MA series, are said to be especially useful in electrical computers and similar devices. Buttons of ½ and 1-in.-dia are available in colors.

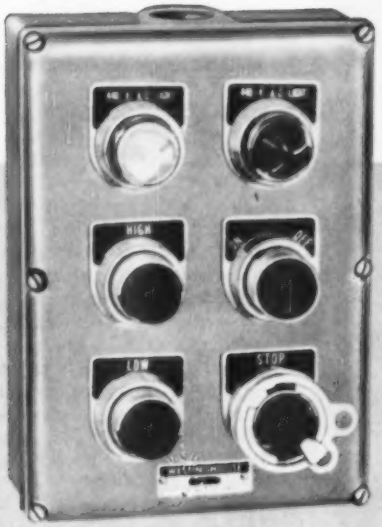
Minneapolis-Honeywell Regulator Co, Micro Switch Div, Freeport, Ill

Air valve, 3-position, 4-way double-solenoid, has a neutral position and can be furnished with open center (Model 1013) or closed center (Model 1023). Both models are tapped for ⅜-in. pipe.

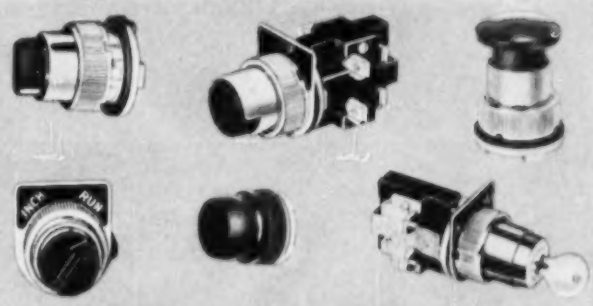
Mechanical Air Controls, Inc, 10030 Capital, Oak Park, Detroit 37, Mich

Dust collector, Model 30NW50, has been added to Dustkop line. Model has an air-handling capacity of 3600 cu ft of air per minute, with a static pressure of 6 in. of water. Emptying and maintenance are simplified by two dust cans on roller casters which are removable from the unit. Collector is available as a recirculating air unit, or with attachments for outside exhaust when it is not possible to recirculate air within the plant.

Aget Mfg Co, Adrian, Mich



Oil-Tite* Control Station
. . . 1 to 16 units



Standard Components Available

Standard Duty
Available in one, two and three unit stations.

Heavy Duty
Comes in a choice of from one to seven unit stations.

Pendent Type
In standard, heavy duty and Oil-Tite enclosures.

Special Service
Units for mining, steel mills, extra heavy duty.

Get delivery now on complete Westinghouse pushbutton line

The most complete selection of pushbutton units in the industry—for standard or heavy duty, oiltight, pendent-type, and corrosion-resistant applications—now available for immediate shipment.

Standardized and interchangeable component parts quickly give you the right pushbutton for every application. Even the latest additions to the Westinghouse pushbutton line such as the new and unique Push-to-Test indicating light, which permits an immediate check for burned-out bulbs, are always available right "off the shelf". Immediate delivery also available on a choice of enclosures for surface, flush or pendent mounting—for indoor, outdoor, water and dust-tight, oil-immersed or corrosion-resistant applications.

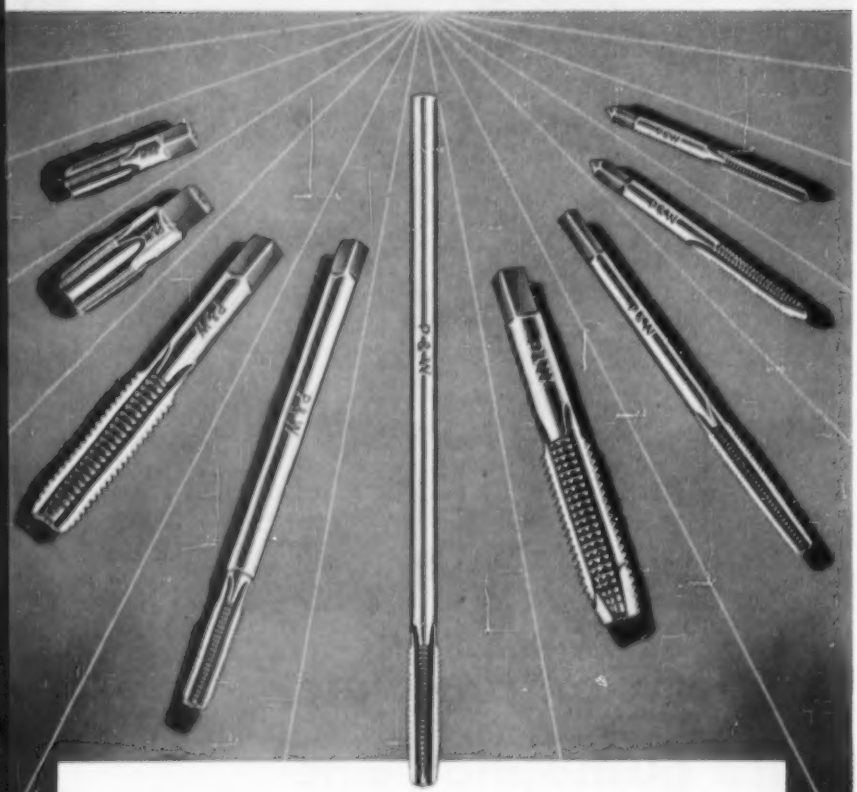
Order Westinghouse pushbuttons *today*—get 'em *tomorrow* (or sooner), right off the shelf. Call the control sales engineer at your nearest Westinghouse office, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa., and ask for descriptive bulletin 15-000. J-30191-A

*Trade Mark

YOU CAN BE SURE...IF IT'S
Westinghouse

PRATT & WHITNEY *Quality* TAPS

for the long run . . .
because they run longer!



Next time you're figuring tooling costs, remember it's not the purchase price that's most important. It's what you get for your money . . . the number of clean, accurate threaded holes each tap delivers on the production line!

Correctly designed, carefully manufactured and rigidly inspected, *every* Pratt & Whitney Tap you buy has the same high quality. There is a complete line for all your needs . . . available from on-the-shelf stock at Pratt & Whitney Branches everywhere.

Write now for P&W Ground Thread Tap Circular No. T-583 and Cut Thread Tap Circular No. 541.

PRATT & WHITNEY COMPANY
INCORPORATED

11 Charter Oak Boulevard, West Hartford 1, Connecticut
Branch Offices and Stock in Principal Cities

MACHINE TOOLS • GAGES • CUTTING TOOLS

NEW SHOP EQUIPMENT

Head- and tailstock positioners produced by Webb Corp are normally built in pairs, one consisting of a constant-speed, motor-driven headstock while the other consists of an idling-type tailstock. Positioners are available in sizes ranging from 5000-lb capacity to 32,000-lb capacity. Power to motor-driven headstock is through motor-reducer direct to pinion and final drive gear. All gearing is cut-tooth steel gears and all primary gear reduction operates in enclosed oil bath. Motor is equipped as standard with built-in magnetic brake which instantly stops rotation when control switch is released.

Reed Equipment Div, Webb Corp, Webb City, Mo

Gripper woven wire slings are available with plastic or neoprene covering for handling highly finished stock of any type. Covering can be applied to slings of any length or width; reportedly does not interfere with flexibility—covered units can be used in either basket or choke hitch.

Cambridge Wire Cloth Co, Cambridge, Md

Wheels for floor trucks and trailers are available in aluminum alloy in 4 to 12-in.-dia in variety of hub lengths and axle sizes. Capacity range is 250 to 800 lb. They are designed for demountable (on-the-job) rubber tires.

Nutting Truck & Caster Co, 1201 W Division St, Faribault, Minn

Trimmer potentiometer, minimalized Type 101-A, is ¼ in. in dia by 0.430 in. long. May be flush-mounted to the chassis, mounted in conventional diode clamps, or by its 1½-in. tinned leads. Available in standard or nonstandard resistances.

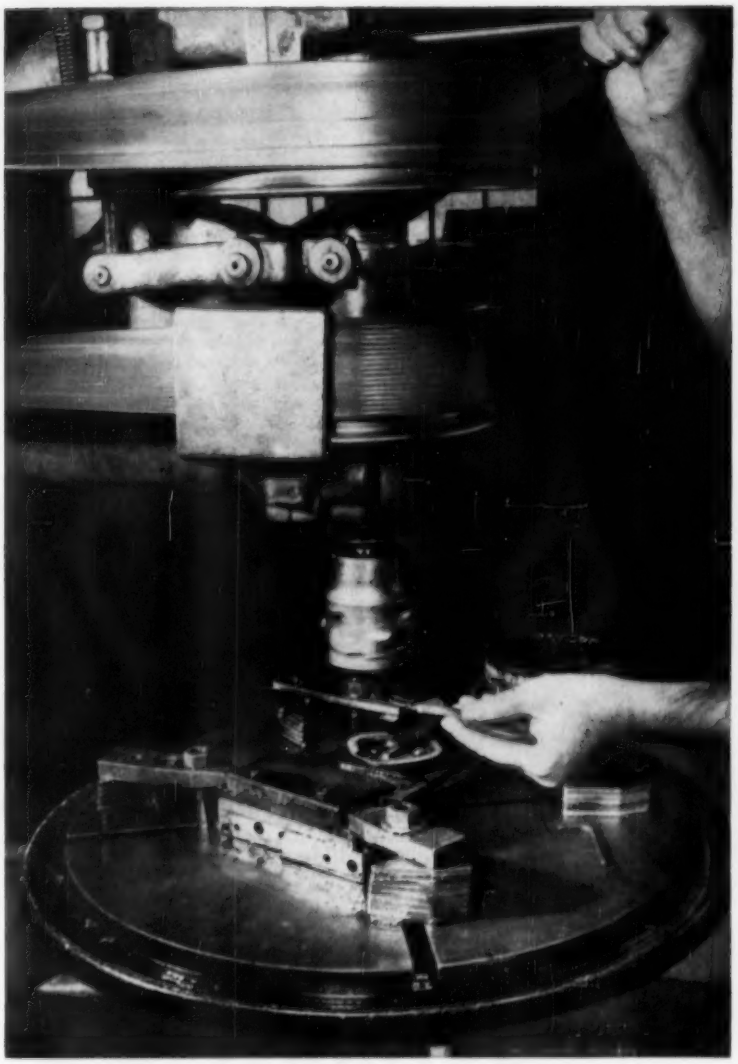
Carter Manufacturing Corp, 21 Washington St, Hudson, Mass

Milling attachment for standard automatic screw machines, known as Turnmill, is designed to mill flats or slots while work is turning in the spindle. Operating during the normal cycle of the machine, attachment advances with the end-tool slide, or can be accelerated. Manufacturer reports that attachment can be furnished for any size and make of screw machine.

Turnmill Inc, 25450 Ryan Rd, Center Line, Mich

Acrylic sheet, 5 to 10 in. in thickness, is said to be perfectly clear with no flaws or bubbles. It eliminates nec-

"INCREASED TAP LIFE FROM 250 TO 4000 PIECES"



Cities Service Chillo Cutting Oil produces astounding results for C.S.S. Machine & Tool Company, Philadelphia, Pa.

Metal stamping . . . precision grinding . . . machining . . . stud welding . . . tool and die making. These are some of the expert operations performed by the 120 skilled employees of C.S.S. Machine & Tool Company of Philadelphia . . . operations based on many years' knowhow and teamwork. And for the past year, with Cities Service cutting fluids, this work has been done with even greater precision, greater efficiency than ever before.

In its tapping operation, for example, C.S.S. increased tap life from an average 250 pieces to over 4000 pieces with Cities Service Chillo Cutting Oil. And in a drilling operation with its Brown and Sharpe Automatics, time required to make one piece was cut from 240 to 165 seconds!

Says President F. G. Schutz: "Cities Service Chillo Cutting Oils are the best we've ever seen. Likewise, Cities Service Lubrication Engineers. It's wonderful to deal with someone who knows our operation so well and has products that help improve it."

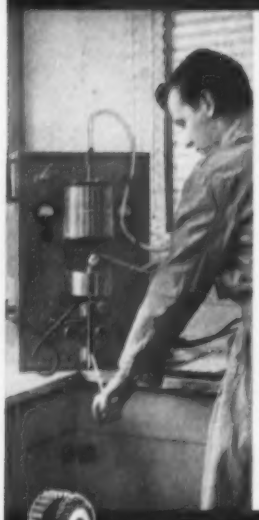
If you have a lubrication problem, or even if you're running smoothly, talk with a Cities Service Lubrication Engineer. He's known for solving problems, known for making smooth operations still smoother. Or, if you prefer, write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

Another of the Reasons Behind Brad Foote Quality—

CARBON DETERMINATION



• In hardening gear teeth by carburizing, carbon content and depth of penetration are vitally important. BRAD FOOTE insures precise control of these factors through metallurgical tests with equipment developed specifically for this purpose.

• A test bar goes through the complete carburizing and heat-treating cycle with every batch of carburized gears. Shavings are taken from this bar at carefully measured depths. Chemical analysis of these shavings gives complete and precise data on carbon content and penetration.

• Carbon determination tests are only one of many metallurgical controls that insure the uniform quality of BRAD FOOTE Gears. Metallographic examination, hardness testing, chemical analysis—these are just a few of the quality checks provided by BRAD FOOTE's completely equipped metallurgical laboratories.

• Add these precise controls to specialized production and heat-treating equipment and a wealth of detailed experience in producing gears of all types—you begin to appreciate why BRAD FOOTE can produce better quality gears at substantial savings.

• Find out how BRAD FOOTE quality can save you money. Send us the specifications on your next job for quotation. No obligation of course. BRAD FOOTE MAKES ALL TYPES OF GEARS—IN A COMPLETE RANGE OF STYLES AND SIZES

BRAD FOOTE GEAR WORKS, INC.

1309 South Cicero Avenue • Cicero 50, Illinois
Bishop 2-1070 • Olympic 2-7700 • TWX CIC-2856-U

subsidiaries | AMERICAN GEAR & MFG. CO. Lemont, Illinois • Phone Lemont 920 * PITTSBURGH GEAR COMPANY Pittsburgh 25, Penn. • Phone SPalding 1-4600

THE KEY TO BETTER KEYSEATS

NATIONAL
Keyseating Millers

NATIONAL Keyseating Millers are mechanically simple in construction, sturdily built, designed for milling internal keyseats, faster and better. Although principally used in Drill Presses they can also be used in Radial Drilling Machines, Horizontal Boring Mills and Milling Machines. An exclusive demountable guide on body of Miller assures a straight keyseat in perfect alignment with axis of bore.

You can depend on National Keyseating Millers for all your keyseating jobs.

national
MACHINE TOOL CO.
CINCINNATI 22, OHIO

WRITE TODAY
for Catalog No. 17
complete, handy size

NEW SHOP EQUIPMENT

essity for laminating to obtain desired thickness for many applications. Available in 24 x 24-in. sheets.

Cadillac Plastic & Chemical Co, Detroit, Mich

Floor lock for materials handling trucks, designated Presto 5-in-1, fits equipment with wheels or casters from 3 to 8 in. in height, without adjustment. It is said to have increased gripping surface, added pressure to floor; steel construction instead of cast iron.

Presto Products Co, 269 Armistice Blvd, Pawtucket, RI

Single-flute countersink, designated Carbide Uniflute, has solid carbide body effective in hard alloy steels up to 65 R_c. Tool is presently available in 60, 82, and 90° in sizes ¼, ½, ¾, and 1-in.-dia. Shanks on first two are ¼ in.; other sizes, ½ in.

M A Ford Mfg Co, Davenport, Iowa

Bright cadmium plating process for use in still tanks is said to make bright dips unnecessary. Cadalume brightener may be added directly to the bath; no break-in period is needed. Process is used to protect iron and steel parts against corrosion, and non-ferrous metals against surface tarnish, corrosion, or galvanic couples formed in assemblies.

Hanson-Van Winkle-Munning Co, Matawan, NJ

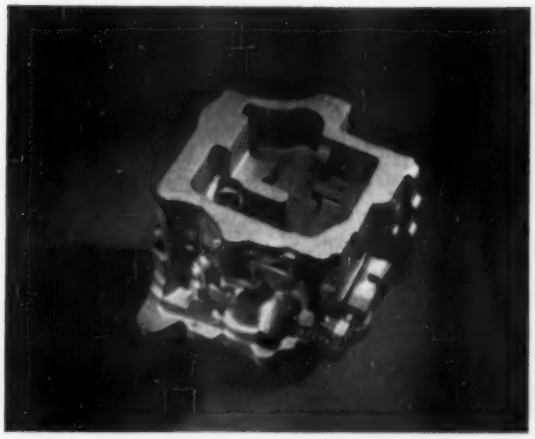
Reciprocating compressor, Type FMP, ranges in capacity from 100 to 300 hp. It is particularly designed for continuous operation under severest conditions.

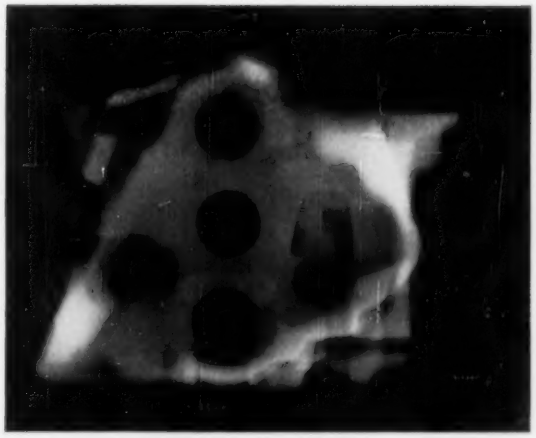
Cooper-Bessemer Corp, Mount Vernon, Ohio

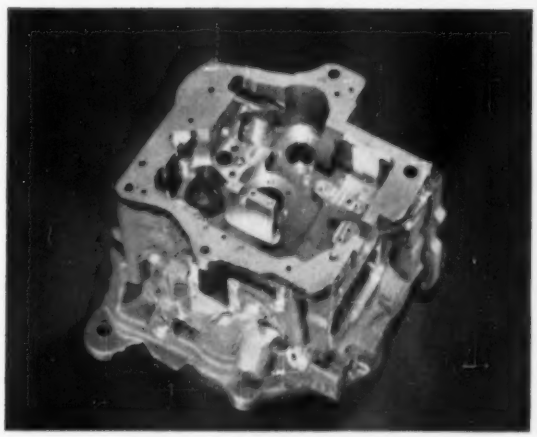
Conveyor belt known as Solarflex is made with a synthetic rubber reported to remain pliable and elastic even when exposed for long periods to the baking action of hot materials at temperatures up to 350 F. Belt is available in a choice of fabric reinforcement which includes glass fabric, rayon-nylon, rayon, cotton-nylon, and others.

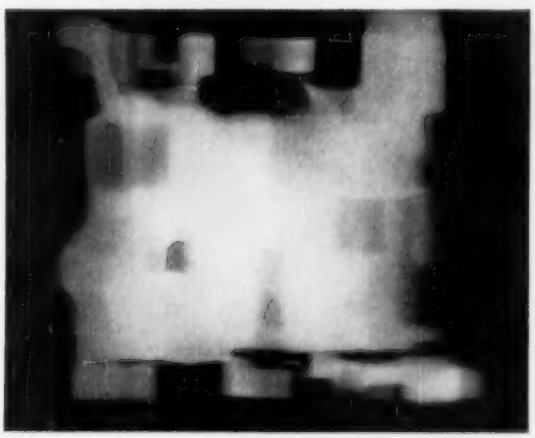
B F Goodrich Co, Industrial Products Div, Akron, Ohio

Liquid rubber coating, called Rubbakote, is used to prevent corrosion in electroplating tanks. Coating is self-vulcanizing, requires no mixing, and is reported to adhere firmly to all types of metal. Liquid dries within 30 minutes after application, is not affected by acid or alkali, and









Sound casting yield jumped from 50% to 96%...

when radiography pointed the way

A jet plane fuel pump called for this intricate casting. The alloy was 355 AMS4214—often prone to gas holes and shrinkage. Rejects from the initial supplier ran as high as 50 per cent.

Then Oberdorfer Foundries undertook to do the job. By studying radiographs made of pilot castings, they developed new methods of gating and position of chills. Sound casting yield rose to 96 per cent. Costs dropped. And an enthusiastic customer became a firm friend.

This is typical of the ways radiography can improve foundry operations. It points ways to better castings. It saves countless hours of expensive machining by exposing castings not worth the work.

If you'd like to talk about radiography—discuss how it could help you, get in touch with your x-ray dealer. Or if you like, send for a free copy of our booklet, "Radiography as a Foundry Tool."

EASTMAN KODAK COMPANY
X-ray Division
Rochester 4, N.Y.

RADIOGRAPHY...
another important example of Photography at Work

Kodak
TRADE MARK

Duplication

Duplication

KOPY-KAT Duplication

is a direct hydraulic transfer with no intermediate motions

machining is completely automatic

there is no chance for irregularities or error in final work

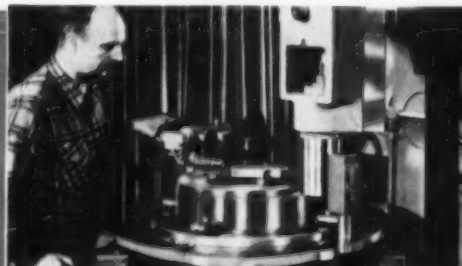
The KOPY-KAT is adaptable to an endless variety of duplicating jobs, from the simplest to the most complex. Manufactured specifically by Rockford Machine Tool Co. for use on new machines, it becomes an integral operating part of any hydraulic shaper, planer or slotter on which it is installed.

Investigate the KOPY-KAT which duplicates automatically with the ease of straight-production machining . . . and faithfully reproduces many forms previously considered impossible to machine.

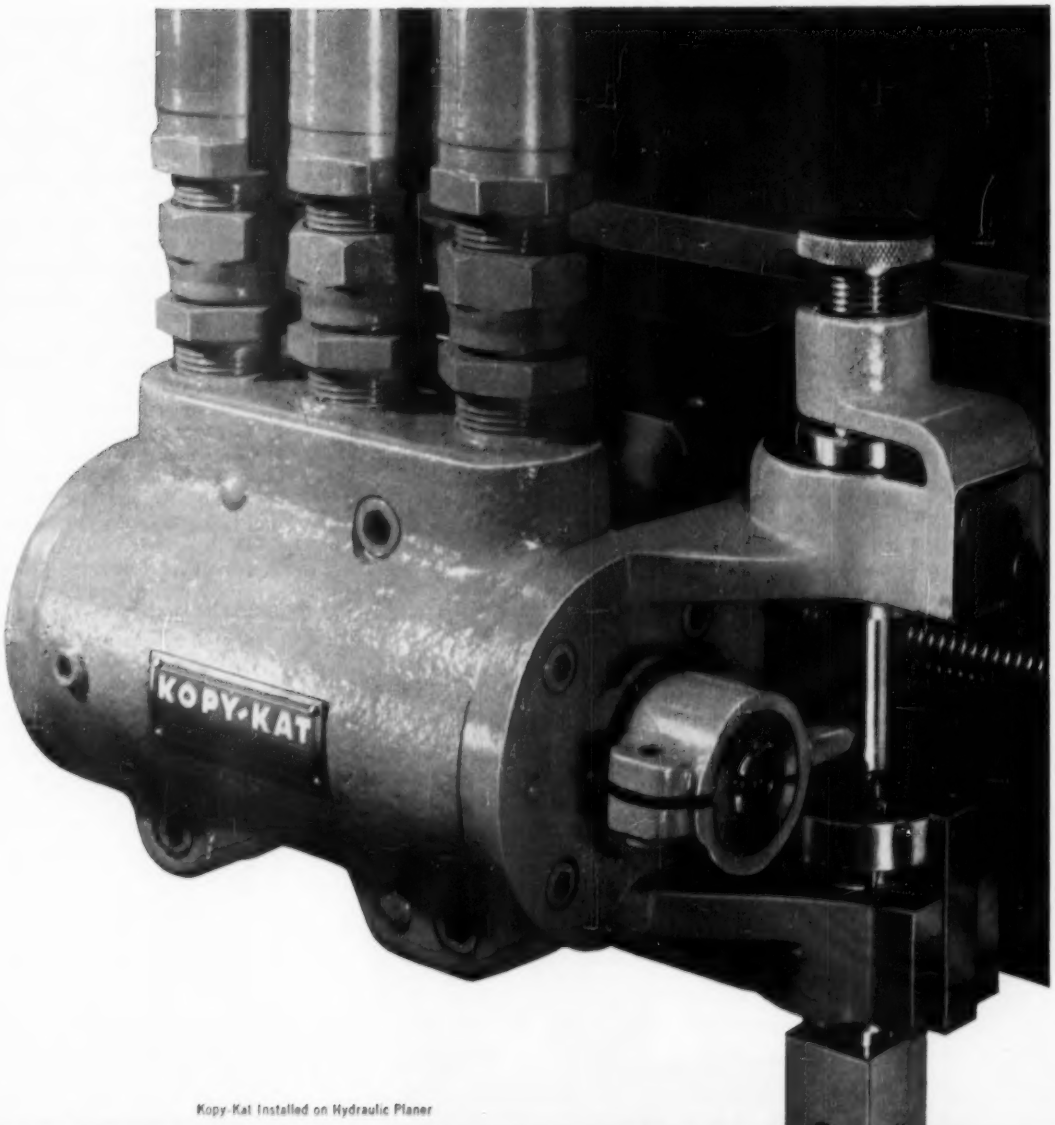
Ask a Rockford Machine Tool Co. representative for further information . . . or write directly to us.

Kopy-Kat Installed on Hydraulic Slotter

Kopy-Kat Installed on Hydraulic Ram Shaper



SHAPERS • PLANERS • SLOTTERS • SHAPER-PLANERS • LATHES



Kopy-Kat Installed on Hydraulic Planer

A new motion picture film "The Rockford Kopy-Kat" is available through your local distributor.

ROCKFORD MACHINE TOOL CO. ROCKFORD, ILLINOIS

HAVE YOU HEARD ABOUT THIS EXTRAORDINARY CLEANER?

It saves money in paint shops!

Oakite Rustripper is an alkaline material that strips paint, pigment residues and phosphate coatings from steel at the same time that it removes rust and oil.

It saves money in plating shops!

Oakite Rustripper removes rust or heat scale from steel at the same time that it removes oil and other soils. It avoids hydrogen embrittlement, damage to machined surfaces and other disadvantages of acid pickling.

FREE

For more information about how Oakite Rustripper eliminates operations in paint shops and plating shops, send for one or both of the illustrated booklets listed in the coupon.

Technical Service Representatives in Principal Cities of U. S. and Canada

Export Division Cable Address: Oakite

OAKITE

SCIENCE

OAKITE PRODUCTS, INC.
24 Rector Street, New York 6, N. Y.

Send me free booklet checked below:

☐ "Here's the best shortcut in the field of organic finishing"

☐ "Here's the best shortcut in the field of electroplating"

Name _____

Company _____

Address _____

can be easily applied by brush or spray.

Rubba, Inc, 1015 E 173rd St, New York 60, NY

Heat Warner is metal tube with inner cartridge which warns of danger when temperature passes limit set by purchaser. Device will produce a heavy smoke and a pungent odor at factory-set temperatures ranging from 137 F to 450 F. Warning system is reported especially useful in any operation where friction creates overheating. Device is available in various shapes and sizes to suit individual needs.

Humphrey-Wilkinson, Inc, North Haven, Conn

Small black-granite surface plate for bench use, known as Toolmakers Flat, is 8 x 12 x 2 in. in size, weighs 15 lb, and is finished to over-all accuracy of 0.0002 in. Plate is priced at $22.98, and plywood case, felt-lined and leatherette-covered, is available optionally at $4.95.

Collins Microflat Co, 2326 E 8th St, Los Angeles, Calif

Safety hoist hooks in Williams line have non-corrosive snap springs and are designed so that maximum throat opening is available. Units are available in both shank and eye patterns in a range of capacities from 1200-lb to 30-ton load strength. Hooks are heat-treated after forging for maximum strength and toughness.

J H Williams & Co, 400 Vulcan St, Buffalo 7, NY

Perspective-drawing system incorporates sets of seven grids in three sizes for both external and internal views. Grids are progressively displaced from each other in steps of 20°. Rotation of a basic set makes possible a total of 81 different positions in the representation of a subject. Sets include selector chart for determining which grid and grid position to use for the viewing angle desired, plus an instruction handbook.

Perspective, Inc, 408 American Bldg, Seattle 4, Wash

Mounting hangers for precision, rotating components such as motors are available from stock. Cast-aluminum units are acid-finished and anodized according to military specifications, and are offered either with two tapholes for bottom mounting or with clearance drill holes for top

mounting. Type L2 mounting cleats for mounting motors to hangers or mounting plates are also available from stock. Catalog No. 7.

PIC Design Corp, 160 Atlantic Ave, Lynbrook, LI, NY

Vitrified grinding wheel is colored pastel yellow to provide sharper contrast so that operator can see work better. Maker points out that colored wheel also assures quicker recognition in stockroom as a replacement item.

Electro Refractories & Abrasives Corp, Buffalo, NY

Bisphenol A, an intermediate in the formulation of epoxy resins, is now available in commercial quantities. High-purity compound is said to have excellent heat stability.

Monsanto Chemical Co, 1700 S Second St, St Louis 4, Mo

Flush-headed, self-locking nut suitable for temperatures from −65 F +1200 F is offered by Shur-Lok Corp. Device incorporates Shur-Lok locking feature, which eliminates non-metallic inserts. Designated SL52 Series, nut is offered in sizes from 8-32 to ⅜-24, and may be manufactured in larger sizes on request. Nut is made from alloy steels, carbon steels, and stainless steels.

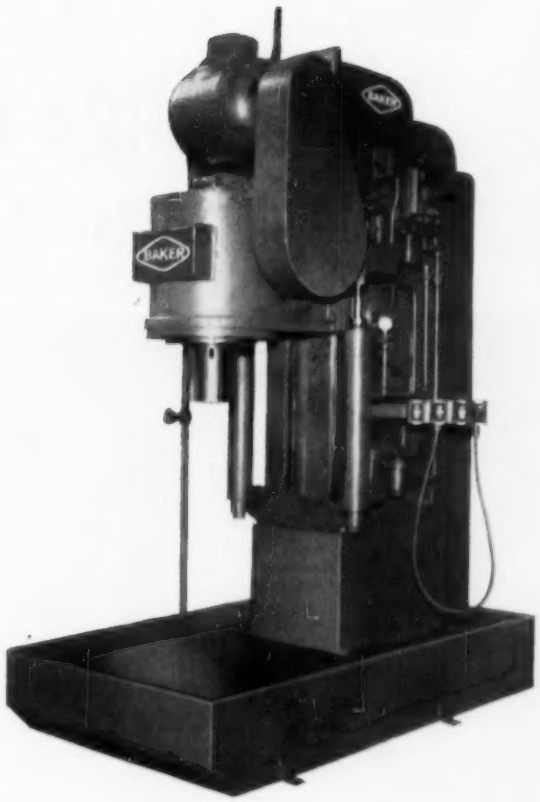
Shur-Lok Corp, PO Box 163, Fullerton, Calif

Fluorocarbon plastic laminate with high temperature and extreme chemical resistance has been developed for use as a lining or surfacing material. Product consisting of a thin, continuous layer of KEL-F Plastic on glass cloth, can be adhesive-bonded to almost any contoured surface.

M W Kellogg Co, Chemical Mfg Div, PO Box 469, Jersey City 3, NJ

Epoxy resins added to Marblette line of plastic materials includes the following: Laminating resin No. 602 is tailored to meet need where extreme wear is anticipated, as in producing draw dies and other metal-forming tools, routing fixtures and foundry dies; coating resin No. 613 has heavy consistency which makes it spread evenly when brushed onto a mold and which assures that it will not run off vertical surfaces; surface casting resin No. 612-B has Rockwell M hardness of 98 with low shrinkage and excellent adhesion to variety of materials.

Marblette Corp, 32-21 30th St, Long Island City 1, NY



automation pays . . .
EVEN ON SHORTER RUNS

Yes, it does — when you automate with *standard* Baker Basic machines. They cost much less than a machine specially built for only one part . . . and pay off quicker. For example, a manufacturer recently installed 3 Baker Basics on relatively low-production jobs. He estimates that the savings through automatic operation will pay for the machines in 3 years or less. Ultimately he will incorporate these Baker Basics into a transfer machine. Baker Basics can be retooled with comparative ease and at less expense. They needn't be completely "rebuilt" for a change in product or production method. For drilling, boring, tapping and other machining operations. In 5 sizes.

BAKER
AUTOMATION
Best in the long run
Practical in the short run

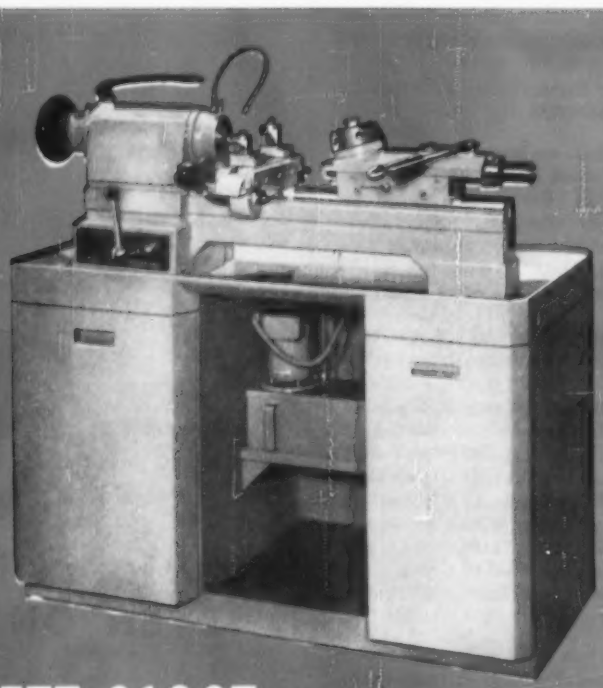
.. Mail Coupon Today ....
BAKER BROTHERS, INC., Dept. AM-456
Toledo, Ohio
Please send free Catalog on Baker Basic machines.

NAME AND TITLE
COMPANY
ADDRESS
CITY ZONE STATE

a challenge to the rated capacity of your present hand turret lathes!

Compare your present

1. output
2. tolerances
3. set-up time
4. rejects



with a new RIVETT 918ST – *and get the startling proof of how much you can increase output per machine per manhour!*

Evidence from RIVETT customers shows that—

1. Instant Start-Stop of Spindle Doubles Output (even on short runs of varied pieces)
2. Tolerances—Measured in "Tenths" (on all types of work)
3. Simplified Tooling Cuts Set-up Time in Half!
4. Rejects—NEXT TO NOTHING

Rivett Features Less Labor Per Piece • *Write for Bulletin 918STB and See!*

RIVETT

RIVETT LATHE & GRINDER, INC., Dept. AMR4, Brighton 35, Boston, Mass.

NEW SHOP EQUIPMENT

Pneumatic regulators, Series 5000 in Governaire line, are intended primarily for remote setting of controllers, pneumatic gaging applications, and laboratory use. Controllers reportedly do not drift during the day, and change in control point due to periodic shut-down is said to be negligible. Ni-Span C measuring element, which is hysteresis-free and does not vary under operating temperatures, enables high accuracy to be obtained. Extremely small relative motion between pilot valve and seat (usually less than 0.0001 in.) required to effect substantial changes in main valve position, also accounts for accuracy of controls. Regulators are available in 25- and 60-psi standard ranges, for ⅛- and ¼-in. pipe sizes. Units are supplied with single ¼-in. NPT tap for a gage. Flow capacity is said to exceed 6 cfm.

Governaire Div, Bellofram Corp. Burlington, Mass

Remote control of traveling cranes is possible with Femco electronic system, which uses carrier current over existing power rails in plant. Operator can raise or lower hoist, position trolley forward or reverse, travel forward or reverse, and energize or turn off the magnet, all from the floor. As many as eight cranes can be controlled on one power circuit by use of different carrier frequencies. When two control panels are used, a crane can be loaded by one man and sent to the other end of its runway, where another operator can unload it and send it back.

Femco, Inc, Irwin, Penna

Plastic-coating process for coating metals, ceramics, glass, and wood with various types of plastic materials is designated Whirlclad, and is German process adopted in US by Polymer. Polymers used in process are prepared in finely divided solid form, and are essentially pure in that they normally contain only minor modifying agents; no plasticizers or solvents are required. Process consists of dipping preheated articles into a fluidized bed of plastic material. Melting point of material to be coated must be higher than that of the coating material. For best adhesion, surface of article to be coated is roughened by blasting with angular shot. Company offers standard licensing program, together with necessary equipment, for any companies desiring to do their own coating.

Polymer Processes, Inc, Div of Polymer Corp, Reading, Penna

ACCO products

Wilson "Rockwell"* Hardness Testers

Production line speeds with laboratory accuracy

• There is a WILSON "ROCKWELL"* Hardness Tester to meet every requirement—from laboratory testing to automatic testing at the rate of 1000 pieces per hour.

J Model
Manually operated

Supplied in both NORMAL and SUPERFICIAL testing types. Designed for testing tools, machine parts and all ferrous and non-ferrous metals, hard or soft, except thin sheet steel.

Y Model Motorized

Suitable for testing work now being done with J models when it is advisable to increase testing speed. Motorized mechanism removes the major load in the test cycle. Set-O-Matic Dial Gauge eliminates need of manually setting dial gauge to zero.

Fully Automatic

Executes complete test cycle automatically at the rate of up to 1000 pieces per hour. Will classify tested parts as "correct," "too hard" and "too soft." Controls hardness limits within two Rockwell numbers. Has safety stop if pieces are not fed properly.

A WILSON hardness testing expert is located near you. Save time and money on your Testing problems. Write or call today.

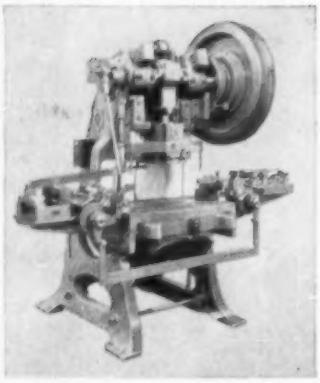
*Trademark registered

WILSON "ROCKWELL"...
the world's standard of hardness accuracy

ACCO
Wilson Mechanical Instrument Division
AMERICAN CHAIN & CABLE
230-B Park Avenue, New York 17, N. Y.

for Better Value

Which one is best?

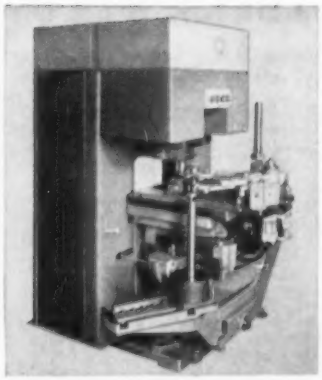


INCLINABLE . . .

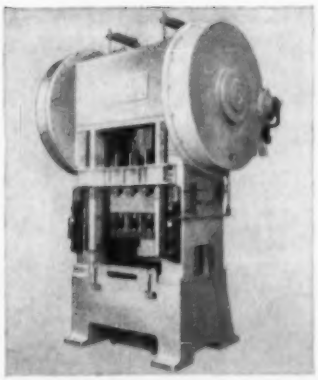
Combined Experience and V&O Press Now Selecting Best Press

MERGER OF HENRY & WRIGHT AND V & O PRESS field sales organization means one source of information and assistance on the important basic types of mechanical presses. It means that you can count upon no-axe-to-grind counsel in appraising the basic type of unit best suited to your immediate and long range requirements.

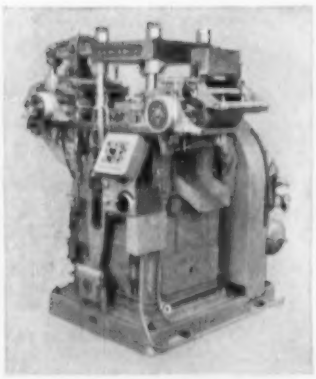
You may be considering a press modernization or replacement program right now — and weighing the pros and cons of various press types. Whatever the end result you are seeking, it will pay you to consult the H & W — V & O representative nearest you. He will be glad to add his experience to yours in working out the best solution. *Why not write us for his name, or send for our digest of presses* to Press Divisions, Emhart Mfg. Co., 481 Windsor St., Hartford, Conn.



NOTCHING MACHINE . . .



STRAIGHT SIDE . . .



DIEING MACHINE . . .

# of Henry & Wright Yours to Use in for Your Needs

EMHART MFG. CO.

PRESS DIVISIONS

HENRY & WRIGHT
HARTFORD, CONNECTICUT

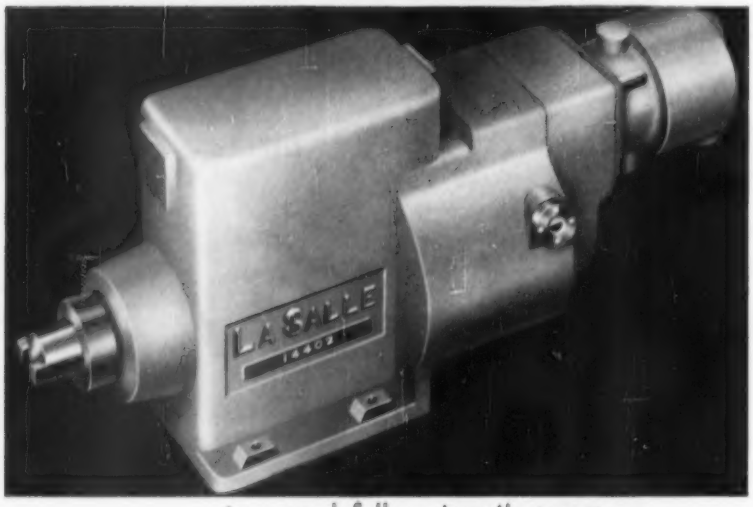
THE V & O PRESS CO.
HUDSON, NEW YORK

Presses and methods that automatically reduce costs

La Salle

AUTOMATIC | POWER | WRENCH

practically eliminates breakage of cutting tools!



IT'S NEW!

two-speed fully automatic power

It's synchronized with the machine cycle to give you automatic engaging and disengaging of parts. Controlled torque eliminates positively all guesswork in clamping pressure.

operates on machine tool principles

A high speed low torque approach; a low speed high torque clamping; and a low speed high torque break clamp and a high speed low torque return.

STARTLINGLY DIFFERENT!

features fluid motor drive

You can clamp light parts or parts with thin-walled areas without fracturing and you can always repeat the clamping torque from cycle to cycle.

fits any type of production machine

GOOD NEWS FOR PRODUCTION MANAGERS!

They're designed to fit any special or any standard machine in use today—such as Multiple-Drilling Machines, Lathes, Boring Mills, Grinders, Screw Machines or Thread Millers.

unit mounted quickly

The design permits either vertical, horizontal or angular mounting—to serve your particular needs.

now available in two standard sizes

Smaller model has a torque capacity up to 1200 inch/pounds; larger model from 800 to 5000 inch/pounds. To control and regulate properly a hydraulic power package is provided.

La Salle tool, inc.

ENGINEERING & BUILDING SPECIAL MACHINERY

3840 East Outer Drive • Detroit 34, Michigan

Free Literature

To order any of these bulletins, please use cards at start of this section—page 192e.

MACHINES AND ATTACHMENTS

34 COPY GRINDING MACHINE—*Carl Hirschmann Co, Manhasset, NY.* 4-page folder describes method used for grinding two duplicate lathe tools, form tools, thin profile gages, or production parts simultaneously on Copyrex machine.

35 METALWORKING EQUIPMENT—*Waterbury Farrel Foundry & Machine Co, Waterbury, Conn.* 12-page booklet "4 in 1" illustrates machinery produced by each of the company's four divisions: Cold Heading Equipment; Power Press; Rolling Mill Machinery; and Wire Drawing Equipment.

36 STUD DRIVING MACHINES—*Syracuse Special Machine Co, Syracuse 3, NY.* 4-page bulletin contains illustrated description of two models for driving from 1 to 12 or from 1 to 6 studs simultaneously at any angle up to 30°.

TOOLS AND ACCESSORIES

37 MASTER SPACER—*Erickson Tool Co, Cleveland 14, Ohio.* 4-page illustrated bulletin gives detailed data on specific applications, including milling, drilling, inspection. Dimensions and construction features covered.

38 INDUSTRIAL IMAGE INTENSIFIER—*North American Philips Co, Research & Control Instruments Div, Mount Vernon, NY.* 3-page bulletin gives engineering data on applications. Covers X-ray examination of steel and other metals with high density and absorption characteristics.

39 GRINDING WHEELS—*Electro Refractories & Abrasives Corp, Grinding Wheel Div, Buffalo, NY.* Bulletin T-855 covers wheels for tools and cutters. Vitrified and resinoid bonded specifications listed; data on resin-bonded wheels as used to grind tungsten carbide and high-speed steel cutters.

40 CHAMFERING TOOLS—*Wesson Co, Ferndale 20, Mich.* Bulletins (955-1) cover 45° and (955-2) 30° hand-type Multicut carbide insert holders. Includes dimensions and features of holders which are semi-standard and use standard square type inserts.

● LAYOUT EQUIPMENT — *Repro-Templets Inc, Oakmont, Penna.* 4-page illustrated bulletin describes complete line of colored templets and continuous layout tapes. Request direct on company letterhead.

41 LUBRICATORS—*Lunkenheimer Co, Cincinnati 14, Ohio.* 4-page circular 580 gives illustrated description of line of constant level oil controls; bottle oilers for plain bearing lubrication; glass and aluminum body oil cups. Dimensions and installation instructions for range of applications.

42 HAND TOOLS FOR SHEET METALWORKING—*Niagara Machine & Tool Works, Buffalo 11, NY.* 10-page illustrated bulletin 78 covers compound leverage shears, straight snips, and combination snips. Includes data on bench shears, hammers, mallets, stakes, hollow punches, bending machine.

43 ALL-PURPOSE COMPARATOR GAGES—*Metron Instrument Co, Denver 3, Colo.* 4-page bulletin 200 contains information on 4-in-1 Electric Comparator for all-purpose external measurements from gage blocks to production parts. Specifications for three models given; four

Free Literature

ranges provided in each. Applications illustrated.

44 RATCHET DRIVE LUBRICATOR —*Bijur Lubricating Corp, Rochelle Park, NJ.* 2-page technical reference sheet 55B describes automatic Type NV for servicing small machines and mechanisms where oscillating drive is more readily available than rotary motion. Features illustrated; dimensions and operational data included.

45 HSS CUTOFF BLADES — *Somma Tool Co, Waterbury, Conn.* Data sheet covers line said to incorporate superior hardness permitting unusually high speeds and feeds on automatic screw machines. Features, dimensions, and prices given.

HEAT-TREATING AND WELDING

46 "PROCEDURES FOR PREPARING PARTS FOR HEAT-TREATING"—*Metal Treating Institute, New Rochelle, NY.* Reference sheet gives data to aid purchasers of heat-treating services in connection with proper ordering and specifications of processes. Describes basic information needed by heat-treater when ordering.

47 REPAIR OF CAST IRON PARTS—*International Nickel Co, New York 5, NY.* 4-page booklet contains data on welding of cast iron with Ni-Rod and Ni-Rod 55. Graphic case histories show welding electrodes in action.

48 ELECTRIC FURNACES—*Auto Control Laboratories, Culver City, Calif.* Quick-Selection Chart covers Series 100 high-temp units, designated Thermocal, suitable for range of applications. Standard models, operating up to 2300 F intermittent and 2200 F continuous temps, range in size from 4x4x4 in. to 8½x8x18 in. ID. Features, operational data covered.

PLANT SERVICE EQUIPMENT

49 INDUSTRIAL EQUIPMENT—*Precision Equipment Co, Chicago 41, Ill.* 32-page catalog illustrates and describes complete line, including new lockers, cabinets, shelving, work benches. Styles and capacities covered.

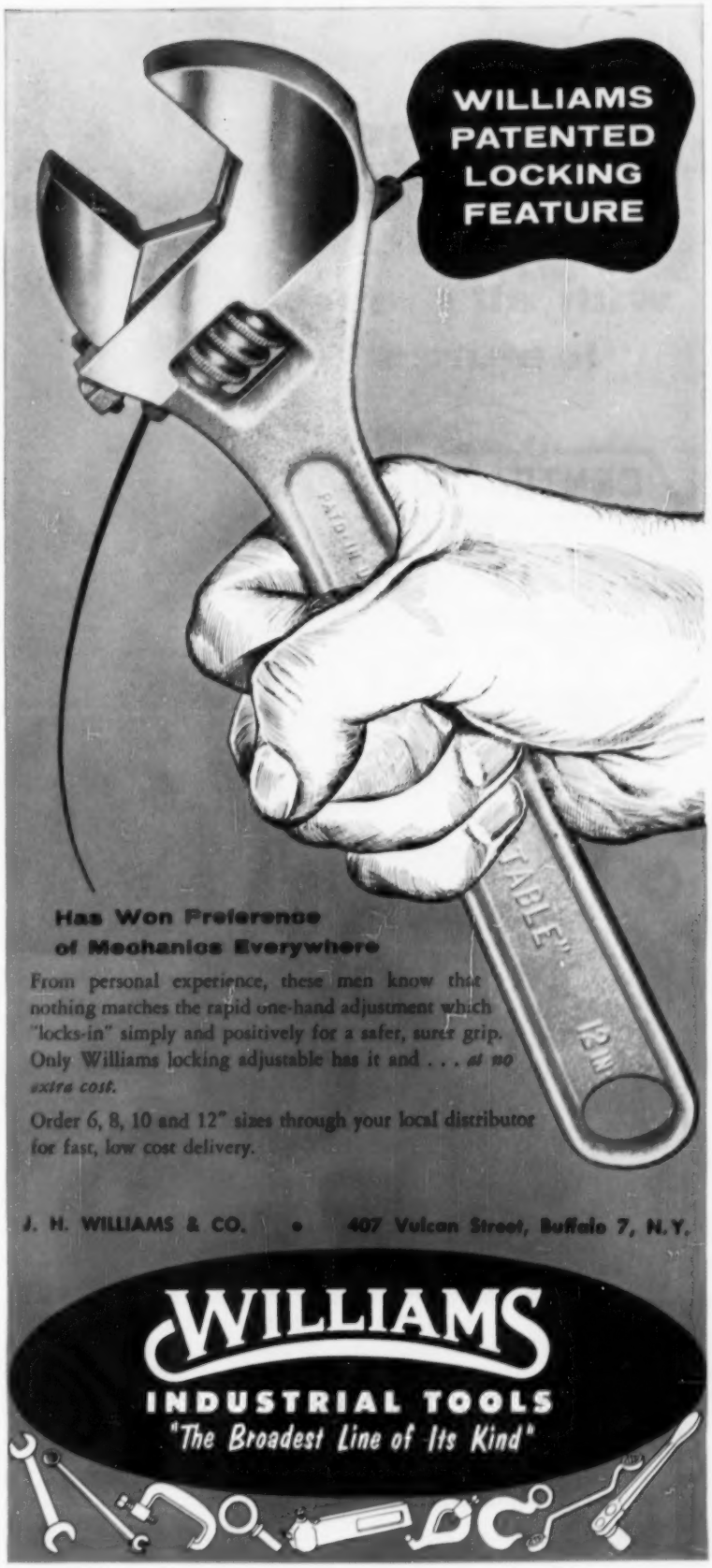
50 VAPOR DEGREASER—*Circo Equipment Co, Clark (Rahway), NJ.* Model OPNT unit is described; features, operating characteristics, applications with variety of solvents covered. Dimensions and specifications included.

51 SANDBLAST MACHINES—*Leiman Bros, Inc, Newark 5, NJ.* 4-page bulletin 1256 illustrates and describes line for cleaning, deburring, surface preparation, stenciling, and matte finishing on metal, glass, plastics, and compositions. Includes dimensions, construction, work range, and operations.

52 STEEL BLAST CLEANING GRIT—*Wheelabrator Corp, Mishawaka, Ind.* 4-page bulletin 903-D covers abrasive called Steeletts for producing etched finishes on metal. Available in seven sizes from G-16 down to G-120; applications outlined.

53 BARREL FINISHING—*Rampe Manufacturing Co, Cleveland 10, Ohio.* Guide outlines six basic essential operating conditions as to size and type of abrasive stone or burnishing balls, load height, speed of rotation, amount of water, ratio of work parts to burnishing balls, and time. Also list new barrel finishing compounds. Chart outlines use for each compound, quantity usage, and prices.

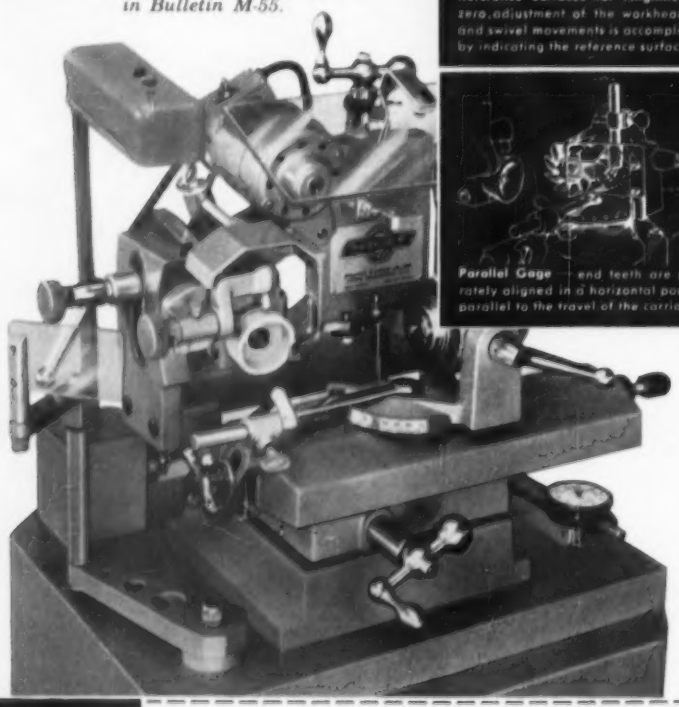
54 HYDRAULIC PUMPS — *NY Air Brake Co, Kalamazoo, Mich.* Bulletin 143 covers Hydreco 3600 Series gear-type hydraulic units for large industrial applications. Describes three pump sizes


WILLIAMS
PATENTED
LOCKING
FEATURE
Has Won Preference
of Mechanics Everywhere
From personal experience, these men know that nothing matches the rapid one-hand adjustment which "locks-in" simply and positively for a safer, surer grip. Only Williams locking adjustable has it and . . . at no extra cost.
Order 6, 8, 10 and 12" sizes through your local distributor for fast, low cost delivery.
J. H. WILLIAMS & CO. • 407 Vulcan Street, Buffalo 7, N.Y.
WILLIAMS
INDUSTRIAL TOOLS
"The Broadest Line of Its Kind"

Only Cutter Grinder in the WORLD with all these features

END MILL
CENTRA-POINT
GRINDER

Specifically designed for sharpening the small cutters that are so difficult to grind on large machines, CENTRA-POINT is fully described in Bulletin M-55.



Clearance Angle Scale — clearance angles are read directly from a graduated scale on wheel spindle assembly.

Mechanical Wheel Dressing — an accurate radius is mechanically dressed on the grinding wheel, in correct relationship to self-registering tooth rests.

Reference Surfaces for Alignment — zero adjustment of the workhead tilt and swivel movements is accomplished by indicating the reference surfaces.

Parallel Gage — end teeth are accurately aligned in a horizontal position parallel to the travel of the carriage.

CENTRA-POINT DIVISION
William H. Field Co., Inc., 326 Dorchester Ave., Boston 27, Mass.

Please send a copy of the new CENTRA-POINT Data Sheet.

Name _____ *Title* _____
(Please Print)
Company _____
Address _____
City _____ *Zone* _____ *State* _____

Free Literature

which provide up to 150 fluid hp; operate at pressures up to 1500 psi. Mechanical features and selection data chart provide information on gpm, pressures, and input horsepower requirements.

55 METALLIC CLEANERS — *Hanson-Van Winkle-Munning Co, Matawan, NJ.* 4-page bulletin C-108 covers application of products in preparing metallic surfaces for electroplating, anodizing, painting. Processes described; reference chart indicates proper cleaner and process to be used with aluminum, brass, copper, steel, lead, magnesium, tin, and zinc.

ROUND TABLE *Discussion*

INSTALLMENT BLUES

Is a raise in pay, or a promotion, the answer for the man who has gone over his head in debt? Won't he be just as liable to incur further debts with a little more money in his pocket?

Credit is very much like fire and water; good servants but dangerous masters. The man who extends his personal credit beyond a safe limit is placing himself in a precarious position. The time may come when he discovers that he just cannot meet all the payments and still provide for himself and his family.

Who is to blame? Certainly not his employer. This man has made a mistake in getting so far into debt and he is making a second mistake in expecting his employer to give

"Oh, night shift's not so bad! It beats working for a living."

Some typical parts produced from HAYNES *alloys*

Custom Tailored to cut maintenance costs

Alloys for Every Wear Condition Shaped to Your Specifications

HAYNES alloys are available in a wide range of properties. They can be supplied as castings, forgings, stampings, or fabricated parts finished to close tolerances and with a mirror-like finish where required.

Some HAYNES alloys are extremely hard—to resist severe abrasion. Some are tough and ductile, designed for use where mechanical shock or repeated stress cause ordinary metal parts to crack and splinter. Some resist the corrosive action of acids, alkalies, and molten metals. Erosion from steam or liquids, the softening effects of high-temperatures, seizing and galling from metal to metal contact, are other severe conditions that can be effectively controlled through the use of HAYNES alloys.

Send us a blueprint of one of your wearing parts and tell us about the conditions under which the part must operate. We are sure we can supply you with a HAYNES alloy part "custom tailored" to solve your problem.

"Haynes" is a registered trade-mark of
Union Carbide and Carbon Corporation.

HAYNES TRADE-MARK ALLOYS

HAYNES STELLITE COMPANY

A Division of Union Carbide and Carbon Corporation

UCC

General Offices and Works, Kokomo, Indiana

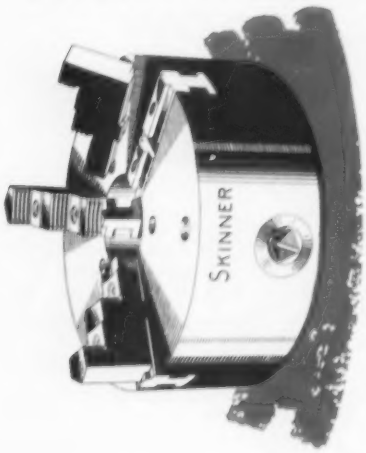
Sales Offices

Chicago · Cleveland · Detroit · Houston · Los Angeles · New York · San Francisco · Tulsa

SKINNER

precision self-centering

SCROLL CHUCKS



POWERFUL!
ACCURATE!
SAFE!
DURABLE!

Skinner self-centering scroll chucks are available in several models, for light, medium and heavy duty jobs in tool room or production runs.

All are of highest quality, made by the most modern machines and methods. Available in sizes from 3" to 18", with semi-steel or forged steel bodies, and heat-treated alloy steel for all other parts. Provided with two sets of solid jaws or two-piece jaws for holding internal or external work. Lands on jaw, jaw steps and end bites are ground after the chuck is assembled.

Write Skinner or your nearest Skinner distributor for illustrated folder.

THE CREST SKINNER CHUCKS OF QUALITY

THE SKINNER
CHUCK COMPANY
203 Edgewood Avenue, New Britain, Conn.

him a raise or a promotion to help him remedy his first error. Did he tell his employer that he would revert to his old rate of pay after he had paid off his debts? He should have, for once he paid them off the reason for getting the higher rate no longer exists. This man is not alone, for the over-extension of credit is widespread.

At the present time the concern of experts in America over the soaring trend of private debts is mounting by the hour. As installment debt alone surges over the $26 billion mark, almost double the level of only five years ago,—the questions are being asked with intensifying anxiety, how high can these debts go? At what point will we find ourselves so overloaded with debts that the whole structure will be in danger of collapse?

From my own observations I am convinced that our anxiety should be not over the quantity of our installment debts; it should be over the quality.

With our incomes higher than ever, jobs at a peak, and our assets at all-time records, we can safely carry giant-size debts. What is frightening, though, is the extent to which more and more financially naive families are buying goods on the loosest credit terms. What is deeply disturbing is the extent to which more and more are going into debt on the misleading basis of their total incomes—instead of on the proper basis of their incomes after allowing for their basic expenses.

Henry George
New York, N Y

Many men make the mistake of spending over their heads. Our own government has done the same thing. There is, however, a great deal of difference; the government can pass it on to the taxpayer.

This employee is making top rate for his job and, although a good

"Y'know, George, I'm getting awfully worried about whatever it was I came out here to stop worrying about."

When steel is 3 times stronger than iron . . .

Has two and one-half times the rigidity . . .

Yet costs a third as much per pound . . .

WHY
aren't more of your products designed for welded steel

Ask
THE LINCOLN ELECTRIC COMPANY
Cleveland 17, Ohio

Creating lower costs for industry . . . with welded steel

New Balanced Mobil D.T.E. Oils—

Socony Mobil D.T.E. Oils have long set the standard for performance of hydraulic and circulating oils. Today, after many years of continuing laboratory research and several years of exhaustive field tests, we announce a completely new line of Mobil D.T.E. Oils. These are balanced to give much greater resistance to deposits, longer life even at high temperatures, superior wear protection and rust prevention.

These new oils will meet the over-all requirements of your hydraulic and circulating systems *better than any other product.*

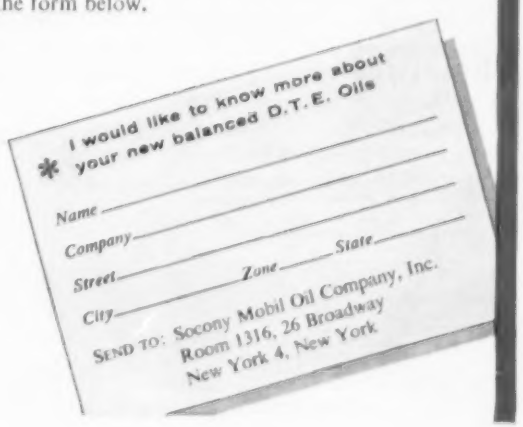
★ ★ ★

For further information on how new D.T.E. Oils can improve your production and cut costs, fill out the form below.

SOCONY MOBIL
CORRECT LUBRICATION

First Step in Cutting Costs

SOCONY MOBIL OIL COMPANY, INC., and Affiliates:
MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION



FREE
new catalog 601...
FORD
cutting tools

12 pages packed full of data on Ford's complete line! Includes H. S. S. and Carbide Rotary Files and Cutters, Countersinks, Carbide End Mills, Grinding Burrs and special tools. Lists all styles, shapes and sizes in easy-to-read tables. Gives dimensions, angles, operating data. Concise descriptions. Illustrated throughout. Your handy reference book on Ford cutting tools. All ground tools are *precision machine ground* . . . tooth spacing is uniform and relief angles are constant on each tool . . . which means faster cutting, longer life, better finishes. Send in today.

Rotary FORD Tools

M. A. FORD MFG. CO., INC.
735 W. River Street, Davenport, Iowa

YES, send me new free Catalog 601 and latest price sheet on Ford Cutting Tools.

NAME
FIRM NAME
ADDRESS
CITY ZONE STATE

workman, he is not capable of promotion to group leader or assistant foreman. A man's earnings are based on what he can do for the company.

The employee cannot claim a raise on the basis that he owes money. Ed can, however, help this man solve his problem. If I were in Ed's place I would talk to top management. Top management could advise this workman. They could very likely help this man to secure a loan large enough to satisfy all creditors. The employee could then pay off one source only with probably less payments per month. A good employee is always worth saving.

A E Salmons
Norristown, Penna

I don't believe there is a man living who works for wages who has not at some time or other succumbed to the lure of installment buying, and found the financial going rocky until the installments were paid off—or nearly enough to get him back on the hook again. Let's face it, the average factory worker would not be able to enjoy the comforts and luxuries that make him the envy of the world without the good old installment buying plan. Also, let's face it again, his employer wouldn't be in the happy position he is right now if the American economy was based on the cash-on-the-barrelhead plan.

Of course, the easy-credit plan can be abused if an individual lacks the will power to apply the brakes. He is in the same position as the man who can't pass the corner saloon, or when once ensconced there doesn't

(Continued on page 250)

"—This is the boss's son. He's starting at the bottom till next week when he'll become plant supert"

TOLERANCES ARE TOLERANCES . . . or are they?

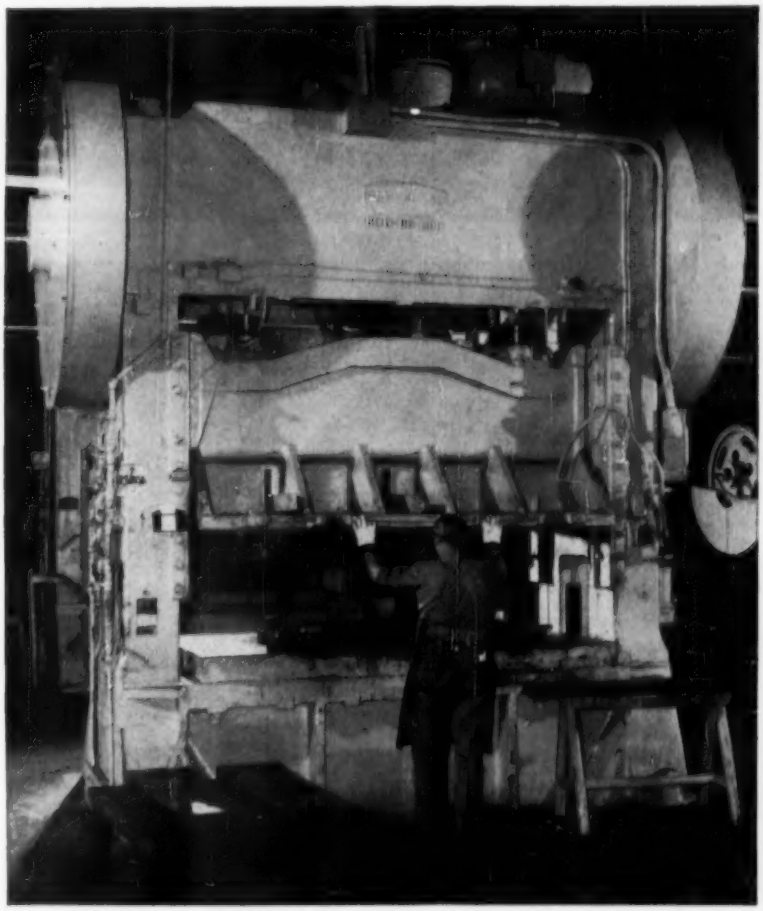
L. A. Edwards
ASST. SALES MGR., THE CINCINNATI GEAR CO.

Our customers' gear specifications call for many different and often critical tolerances . . . say .0002" or .0003" or whatever they may feel is required for their product. Unless asked, we don't question a customer's specifications, but in some cases we've wondered why particularly close tolerances were called for — and if they were worth the *added cost*. We had an occasion to talk to one customer recently about some gears they had us make to .0002" pin size limit. This firm also made some of its own gears. We asked this man if they had any trouble adhering to such strict tolerances and he said yes they did, but if their parts were "close enough" they used them anyway!

Now, this hardly seems logical — for if his own gears, made to slightly more liberal tolerances, were satisfactory for the job, he could have saved his company some money by being more realistic in his tolerance demands of us. We're not just trying to be philanthropic; it's a purely practical matter for us: unnecessarily critical requirements force us to enter a higher bid and so make our work more expensive than need be. Thus he paid more than necessary for the gears to do his job, and we ran the risk of losing a good customer. That's why we're always happy to see a customer go over his specifications with a sharp pencil.

THE CINCINNATI GEAR CO.
CINCINNATI 27, OHIO
"Gears — Good Gears Only"

CINTI



The Cleveland Double-Crank Press shown here draws more than seven parts for the famous Servel Refrigerator.

SERVEL, INC. finds Cleveland Presses

"require very little maintenance . . . have no clutch problems"

Installed in the Home Appliance Division of SERVEL, INC., Evansville, Indiana, in March of 1951, the Cleveland Double Crank Press you see here has been constantly "on the job" producing parts for famous Servel refrigerators.

Carl Linke, Foreman of the Sheet Metal Department, says, "This Cleveland 80D is a good press. We've used it for most of our draw work for the past five years. During this time it has required very little maintenance. We've had no clutch maintenance problems."

As have many of the nation's leading stamping departments, you, too, will find that Cleveland Presses prove themselves to be easy-to-maintain, low-cost producers. Before buying your next press be sure you have the complete Cleveland story. One of the 11 specialized types of Cleveland Presses is sure to be your answer to greater stamping economy. Write or call today!

THE CLEVELAND PUNCH & SHEAR WORKS CO.

Established 1880

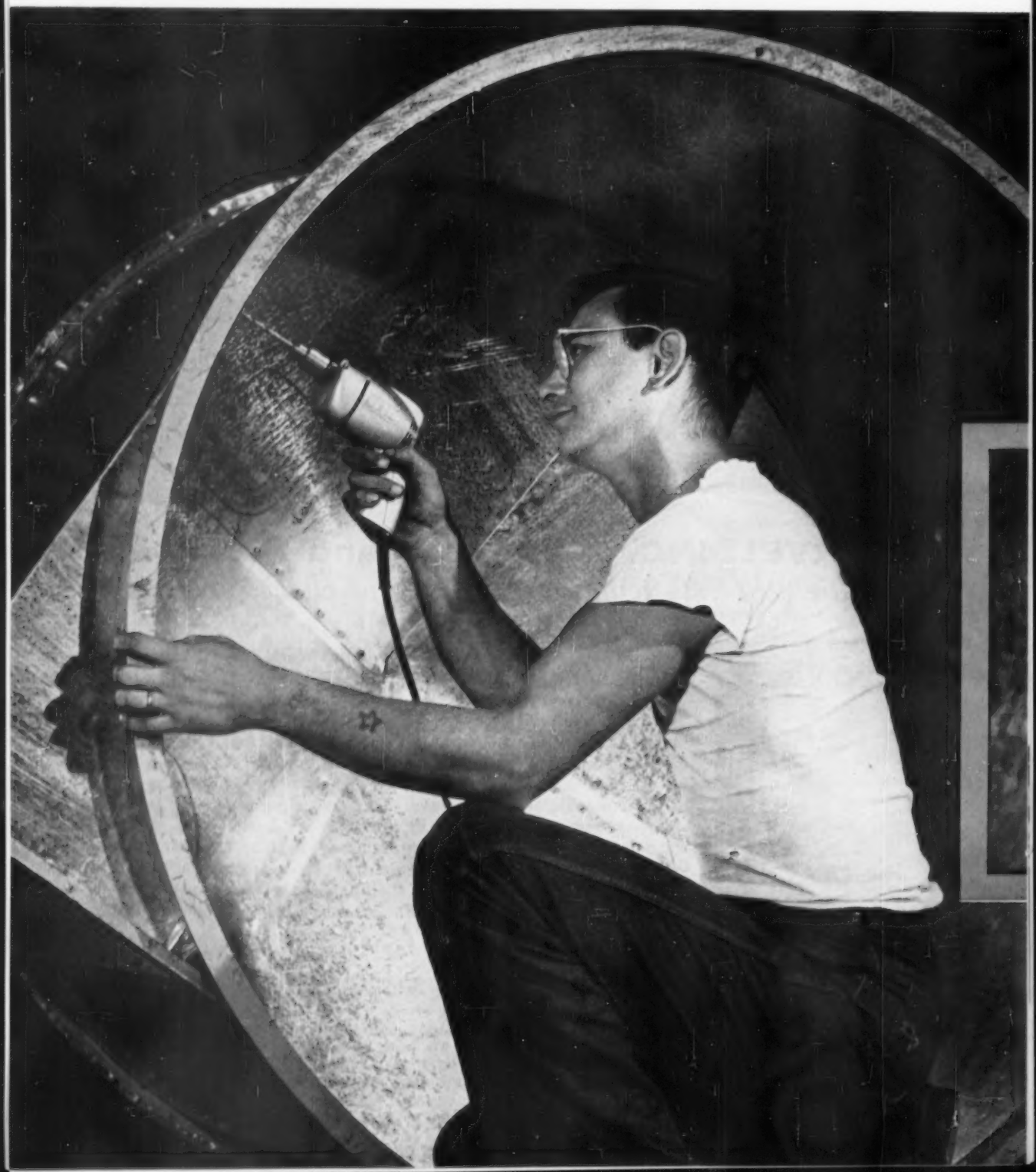
POWER PRESSES – FABRICATING TOOLS

E. 40th & St. Clair Avenue, Cleveland 14, Ohio

Offices at: NEW YORK • CHICAGO • DETROIT PHILADELPHIA • E. LANSING

CITY FOUNDRY DIVISION · SMALL TOOL DEPARTMENT

"SKIL Drills...



stay on the Job twice as long"

says **George Behling,** Superintendent
The Day Company
Minneapolis, Minnesota

"Nothing is so irritating as to have a unit fail on the job," according to Mr. Behling. "In our business, grain and cement dust are a constant source of electric tool failure. With SKIL Model 75 Drills, however, we have far less trouble than with any other make.

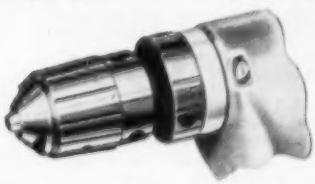
"Our mechanics prefer SKIL Drills. They have extra power and are easier to handle. One other plus feature is the service we get from the local SKIL people, when needed. Our choice of electric drills is SKIL, for long life—ample power and ease of handling."

These Are Some of the Model 75 Features That Make So Many Firms Choose SKIL

- **55% more powerful, yet lighter in weight.**
- **Choice of 7 speeds (500 to 5,000 r.p.m.).**
- **Handy, safety-designed trigger lock for continuous operation—side location for easy use.**
- **All anti-friction bearings for longer life.**
- **Large inspection plate for routine maintenance.**
- **Comfortable "contour-grip" handle.**

When you buy a drill, be sure it's a SKIL.

New Keyless Chuck* speeds bit changing...ends key fumbling!



Now the famous SKIL 75 Drill offers fresh working advantages with high-torque keyless chuck. Gripping power is even greater than with a keyed chuck. Highest accuracy, fine balance, with the shortest overhang of any keyless chuck made! Tightens by hand—no more keys to lose. *Optional at slight additional cost.

FREE! Send this coupon. Your SKIL Distributor will give you a no-obligation demonstration. See how you can increase performance with Model 75 SKIL Drill.

SKIL
PORTABLE TOOLS

Made only by SKIL Corporation
formerly SKILSAW, Inc.
5033 Elston Avenue, Chicago 30, Illinois
3601 Dundas Street West, Toronto 9, Ontario
Factory Branches in ALL Leading Cities

SKIL Corporation, Dept. AM-46
5033 Elston Avenue, Chicago 30, Illinois

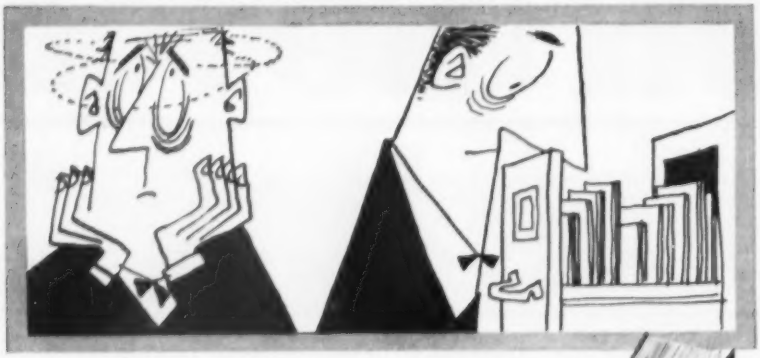
☐ I would like a demonstration and FREE trial.
☐ Please send literature on SKIL Drill.

Name _____

Address _____

City _____ Zone _____ State _____

NEW MACHINE TOOLS ON YOUR MIND?



no need to wait...no need to hunt

when you want the facts on
today's best machine tools
here's the place to get them fast

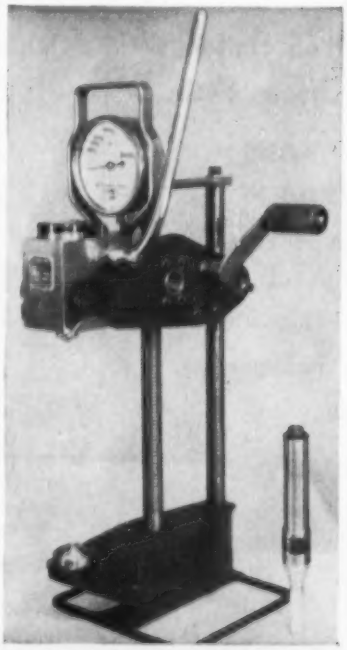
Metalworking production's most convenient, always accessible source of machine-tool-buying facts.

"Machine Tool Catalogs...a great time-saver."
Sweet's Catalog Service
Division, F. W. Dodge Corporation, 119 W. 40th St., N. Y. 18

Versatility Plus

with the

KING PORTABLE BRINELL HARDNESS TESTER...



King Portable Hardness Testers pay dividends where operating ease and guaranteed accuracy are essential. Portable, rugged and dependable, they have almost unlimited applications.

King Hardness Testers can be carried anywhere to test materials in any position. They put a full load of 3000 kg. on a 10 mm. ball, and give a clear, sharp impression. Hardness readings are taken faster and easier. The removable Test Head can test parts of any size.

Kings offers a full range of models and adapters to test spots where other testers cannot reach. Included are: King Test Head for Deep and Offset Testing to reach around corners and into holes—King Reverse Load Adapter to secure easy readings inside pipes and tubes—King Gear Tester for testing gear teeth on the pitch line—and new King Brinell Microscopes for faster reading.

WRITE FOR COMPLETE SPECIFICATIONS

KING TESTER CORPORATION
13th AND BUTTONWOOD STS.
PHILADELPHIA 23, PENNA.

know enough to leave when back of his mind he knows he'll hate himself in the morning.

So, in Ed's shoes I wouldn't feel too sorry for the guy who is suffering that morning-after feeling from his installment binge. Why should he expect to be given a better paying job over other men who are just as capable, because he lacked their intelligence in living within their income? Or why should he load his self-induced troubles on Ed's back in the first place? I can't get too sympathetic about an individual of this type; life is too full of people who have troubles not of their own making.

So, Ed, if our friend who is too willing to "sign on the dotted line" seeks greener pastures, let him go, let him go!

Robert S Alexander
Glastonbury, Conn

Every shop and industrial plant—in fact all businesses—have a stake in our economy. All depend upon the consumer's dollar for their income whether they sell directly to the consumer or to other plants. Each organization should make an effort to encourage thrift among its employees. The organization itself should set a good example by avoiding excessive, over-burdening debts. Credit has a very definite place in our economy and is a valuable tool for business as well as the individual.

The company is not responsible for the economic stability of its employees. Its economic responsibility ends with the paying of the going scale of wages. It cannot be expected to give a man a raise in pay, or a

"It says here that the Employees' Association is planning a special trip to the Dempsey-Tunney fight!"

Compare this latest jig borer for capacity accuracy speed!

KNIGHT'S New Jigmaster

Last word in medium size jig borers—unequalled for extreme accuracy, capacity, increased output.

The totally enclosed spindle and quill mounted on super-precision ball bearings, with quill moving in a solid bearing . . . the extra-wide base and reinforced column, both cast as a single unit . . . the wider bearing surfaces . . . all contribute to the Jigmaster's exceptional rigidity and accuracy.

Any one of three table and saddle locating devices may be used for hole location. All machine controls can be operated from a single convenient location.

Write For Complete Information

SPECIFICATIONS

Table Size	18" x 24"
Table Travel—Longitudinal	20"
—Cross	15"
Vertical Capacity	23"
Throat	20"
Weight	7500 Lbs.

KNIGHT — VERSATILE · MILLERS · ACCURATE · RIGID

W. B. KNIGHT MACHINERY CO. · 3920 WEST PINE BLVD. · SAINT LOUIS 8, MO.

Chicago-Latrobe

High Speed Reamers

extra with cutting mileage built in

Chicago-Latrobe High Speed Reamers are made as if they were intended to last forever . . . and they almost do. So next time order Chicago-Latrobe from your distributor . . . accept no substitutes. The extra life will save you money; the complete line assures service.

DOUBLE CIRCLE TOOLS

Chicago-Latrobe

416 WEST ONTARIO STREET • CHICAGO 10

Drills
Reamers
Countersinks
Counterbores
Carbide Tools
Special Tools

promotion, because he is heavily burdened with debt. To do so would be unfair to the other employees; they would be penalized for living within their incomes. The company's position, as a member of an economy in which a decline or depression hits all, demands their cooperation and assistance to prevent misuse of credit. It is easy to build up a heavy debt, and it does aid today's economy, but it becomes a threat to the future for the period of repayment depresses the economy. The present high level of personal debt threatens the nation's future economy and prosperity.

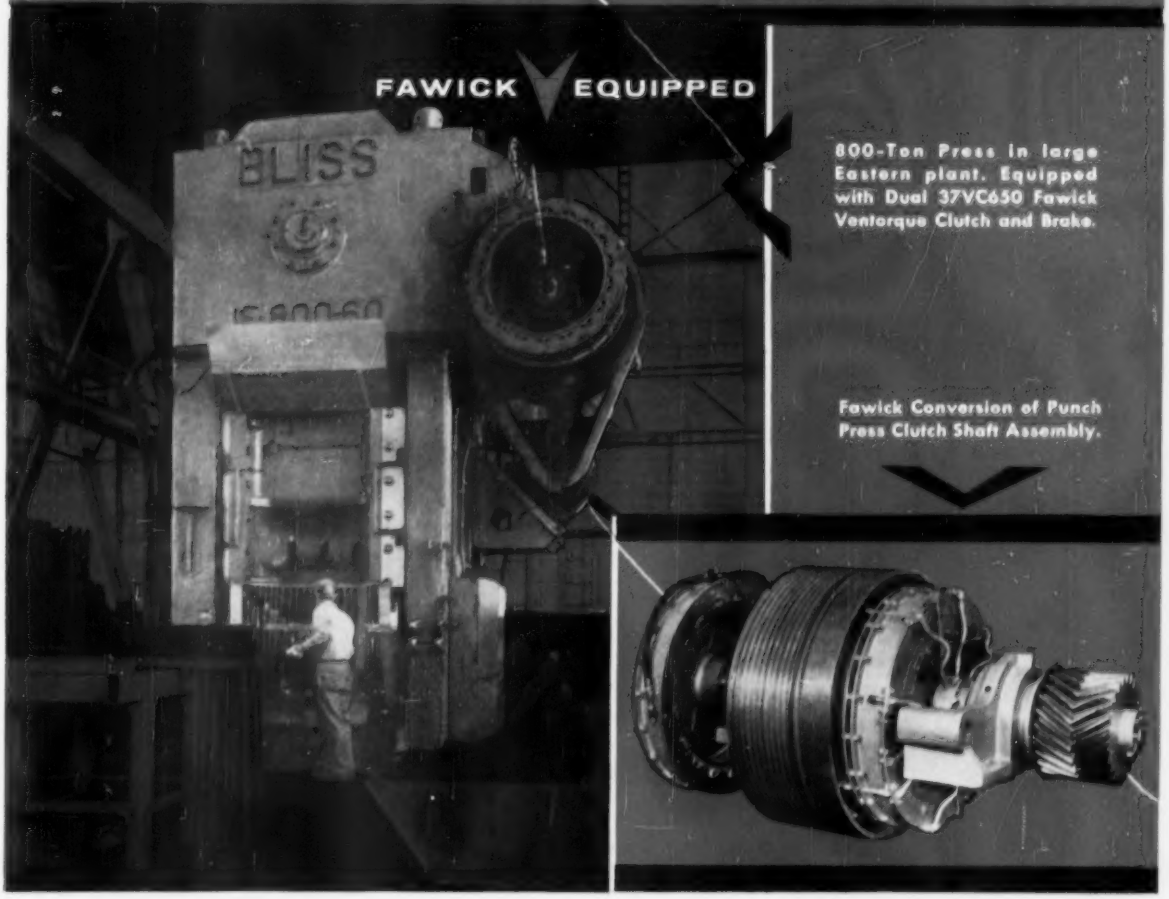
Consumer credit and mortgage debt have increased from about $24 billion at the end of 1945 to about $110 billion today. During the same period, other types of private debt, including stock market credit, farm credit and business borrowing, have increased from $116 billion to over $250 billion. Any further increases in debt should not be viewed with equanimity.

Even though consumers may be in a position to carry the debt and to repay it in full, there may still be adverse effects on the future level of business activity because of the rapidly expanding debt.

When consumers spend beyond their income, they obviously stimulate the economy to the extent of the borrowing. For example a family earning $100 a week may spend a considerably larger sum as it refurnishes a home, buys a car, or a refrigerator. At some future date the family will have to spend less than its current income if it is to repay the loans. During the period

"We appreciate having music in the plant, but we'd like to hear something besides 'Slow Poke!'"

FAWICK *Products in Action*
IN THE METALWORKING INDUSTRY



800-Ton Press in large Eastern plant. Equipped with Dual 37VC650 Fawick Ventorque Clutch and Brake.

Fawick Conversion of Punch Press Clutch Shaft Assembly.

producing more work—more accurately
—and with greater safety!

Installations of FAWICK equipment on heavy duty machines like this 800-Ton Press in a large Eastern factory are constantly proving that "IT OPERATES BEST WHEN FAWICK-EQUIPPED".

Owners and operators of FAWICK-EQUIPPED metalworking machines of many types are constantly reporting FAWICK advantages like these:

"... increases operating cycles and production rates to new highs in our operation".

"... provides unmatched overload protection for our men, machines, and dies".

"... gives us unfailing peak performance on automatic operation".

"... practically eliminates downtime for clutch maintenance".

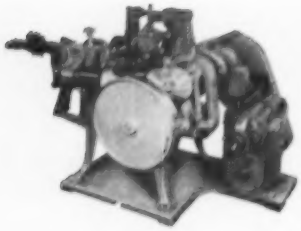
"... reduces die maintenance costs to a minimum".

These and the many other advantages FAWICK can provide for your specific equipment will be fully described by your nearest FAWICK representative. Simply call or write him or the Home Office today.

FAWICK AIRFLEX DIVISION
FAWICK CORPORATION
9919 CLINTON ROAD • CLEVELAND 11, OHIO
In Canada: Fawick Canada, Ltd., Toronto, Montreal

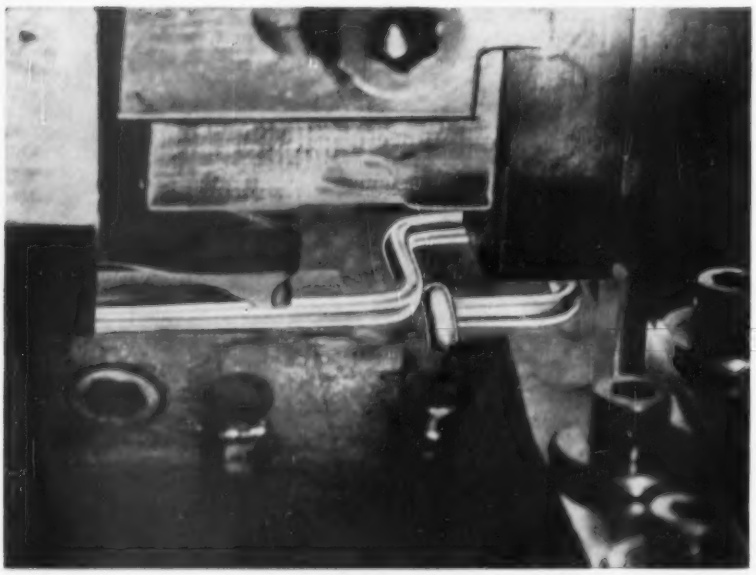
FAWICK *Airflex*
INDUSTRIAL CLUTCHES AND BRAKES

Field Offices and Representatives in Principal Cities



NILSON 4-SLIDES PAY OFF 4 WAYS

• BIG PROFITS • BIG PRODUCTION
• BIG SAVINGS • BIG GAIN IN ACCURACY



Forming Operation: Meter Shunts of 3/16" Wire Stock

WHY NILSON IS TOPS FOR 4-SLIDES:

Nilson 4-Slides are built for rugged duty
Form both ribbon metal and wire stock
Press capacities 8 to 75 tons, wire diameter to ½"

16 Models Available, Including Combinations of Horizontal Press and 4-Slide

YOU PROFIT BY: Automatic Operation • Increased Production • No Secondary Handling • Improved Products • Fewer Rejects • Lowest Initial Cost

Nilson engineers are always available for consultation on forming problems. Bulletin #61 sent on request.

Nilson's 3 tilt and 3 stationary reels handle wire or ribbon stock coils up to 500 pounds.

A.H. NILSON MACHINE COMPANY

1519 RAILROAD AVENUE, BRIDGEPORT 5, CONN.

Automatic Chain Making Machines • Staple Forming Machines • Wire and Stock Reels • Wire Straightening Equipment • Slide Feeds for Presses • Wire and Ribbon Stock Forming Machines

when the purchases are made the economy is stimulated, but while the repayments are being made the stimulus is lost.

Clifford Molloy
Bronx, N Y

I know of no man who lives entirely within his pay. No doubt there are some who do, but I have never met them. I have known men who claimed to live within their pay, but on examination, it developed that they were buying a home on time, paying for an insurance annuity, or undertaking some similar obligation on the installment plan of paying.

Installment buying is one of the products of our age, and is too deep-seated in the American way of life to be dismissed just casually. If installment buying were discontinued, thousands of business men would go out of business overnight. No automobile manufacturer could operate for a month if he were not permitted to sell his cars on time.

On the other hand, I believe it is up to each one of us to keep our time obligations within our own budgets. I think that most people do do that. It seems that Ed's friend is one of those irresponsible characters who ignore addition, and simply get delivery on those articles they crave regardless of whether they can pay for them or not. For that type of man, there is no easy cure. A raise wouldn't help him; he'd simply go out and acquire additional articles with still heavier obligations.

There is no limit to articles which can be bought on credit. Ed's friend simply abuses the privilege of accepted credit rules thereby representing one of that rather small class who won't even attempt to limit their purchases to the size of their pocketbooks. Let him go somewhere else to be unhappy. He will never be happy anyway, but Ed will be rid of him, and that will be something.

James K Matter
Detroit, Mich

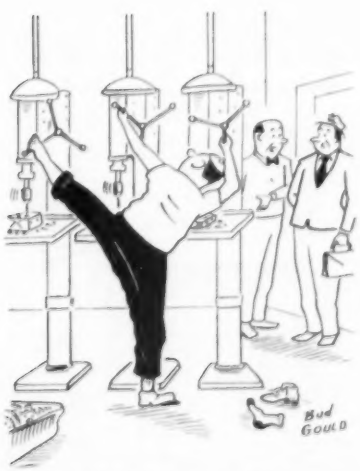
Buying on credit has become a way of life in this country and it is here to stay. It has advantages and disadvantages and as members of a society where it is in wide use we must learn to live with it.

The advantages attached to it are many and outweigh the disadvantages attached to its use. As with a great many aids and conveniences it must be kept under control and used with judgment. Once out of control

it becomes the master and we are a slave to it. Credit is frequently defined as man's confidence in man. It exists because of a desire and willingness to trade money or wealth in existence at the present time for the future earning power of an individual.

Without credit a person would be required to delay making a purchase until he had accumulated the full price. This would mean a delay of months or even years. In a great many cases this delay would mean that the purchase would never be made. Twenty or twenty-five-year mortgages on homes are not uncommon. The mortgage makes it possible for the family to enjoy the pleasures of their own home while paying for it. Without the mortgage they would be required to save for these twenty or twenty-five years and not have possession of the house for all this time. It is doubtful if many families would or could save for this length of time for a home. At the end of such a period their desire and need for a home would have diminished greatly. This same reasoning to a lesser degree applies to the purchase of a car or refrigerator.

The problems attached to credit buying make themselves evident when credit is used without discretion and care. When operating on a cash basis it is possible to spend as much as you earn as fast as you earn it. However you cannot exceed this rate of spending. When credit buying is employed we trade our future earning power for today's purchases. Under this arrangement it is possible to make purchases in excess of our future earnings during



"It's just a one-man shop."

CLEVELAND WORM AND GEAR COMPANY SHOWS HOW

McCaskey Control System Cuts Tool and Operating Costs

Operating costs went down and efficiency went up when the Cleveland Worm and Gear Company started using McCaskey Tool Crib Control.

Mr. Edward Mason, Tool Engineer of Cleveland Worm and Gear and its affiliate, The Farval Corporation, gives the lowdown.

"In both companies, your system revealed we were overstocked on little-used tools and understocked on some in regular use. And since installing McCaskey Controls we have practically eliminated emergency tool orders even though a large part of our worm and gear production is custom-made.

"It has helped us increase the number of tools available without additional purchases by preventing employee hoarding. The installation of the McCaskey Tool Location Board has reduced production delays. Now tools are seldom lost or misplaced and waiting at the crib window has been eliminated.

"You have even helped us cut down on breakage. McCaskey Broken Tool Reports are analyzed as an indication of trouble and unusual breakage is reported to the proper department."

McCaskey Tool and Gage Controls and other Control Systems can offer you comparable benefits. What kind would be best for your operation? Send coupon today for full details.

Find out how McCaskey can help you regardless of your plant size or products.

MAIL COUPON TODAY!

McCASKEY INDUSTRIAL CONTROLS
Production • Inventory • Tools • Maintenance • Costs
Division of
VICTOR ADDING MACHINE CO.
3900 N. ROCKWELL STREET • CHICAGO 18, ILLINOIS
VICTOR-McCASKEY LIMITED,
GALT, ONTARIO
Manufacturers of Business Machines
Cash Registers, Business and Industrial Systems, Electronic Equipment, Electri-Cars.

Victor Adding Machine Co.
McCASKEY INDUSTRIAL DIVISION,
3900 North Rockwell Street
Chicago 18, Illinois

Please send me your new booklet, "How Tool Costs Were Cut 12 Ways in 20 Plants."

Name _____
Position _____
Company _____
Address _____
AM-4-56

A survey of the electrical controls—wherever accessible—used with 849 machine tools exhibited at the recent Chicago Machine Tool Show, established the fact that Allen-Bradley motor starters, relays, timing relays, and disconnect switches led all other makes. Allen-Bradley motor control has gained this position of leadership by its performance . . . its long life . . . consistency of action . . . trouble-free operation. The A-B trademark has come to be recognized as the sign of QUALITY in motor control.

Allen-Bradley Co., 1310 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

***FIRST!* in Starters—** 41% of the starters were Allen-Bradley.

***FIRST!* in Relays—** 46.5% of the relays were Allen-Bradley.

***FIRST!* in Disconnect Switches—** 29.6% of the disconnect switches were Allen-Bradley.

***FIRST!* in Timing Relays—** 51.7% of the timers were Allen-Bradley.

ALLEN-BRADLEY QUALITY
MOTOR CONTROL
The PREFERRED Line
A-B Quality

the scheduled repayment period. This might result from over-estimating our earnings, miscalculation, or a lack of a responsible attitude. It might result from a work stoppage, discontinuing of overtime or a pay-cut. Even though the credit buyer may be in a precarious position as a result of company action it is not their responsibility. If a man is to be given a raise or a promotion it should be because of his work and his interest, and not because of his need.

H Koslow
Bronx, NY

As a staff member of Messrs R S Stokvis & Zonen N V at Rotterdam, I am a regular reader of your magazine and consequently of your Round Table articles. Till now, however, I never felt the urge to comment, though I am always very interested. This time it's different.

The problem of Al and Ed, or rather of the man they are discussing, is universal I daresay. Is it too much indeed to expect a working man to live up to his pay? Asking that question is answering it: *No!* A big, fat *No*, that is.

The man in your article is in debt for a couple of thousand. He probably bought a TV set, a refrigerator, a washing machine, and heavens knows what. A couple of thousand is a lot of money. Of course I don't envy him his luxury possessions. But what is the picture? Let's state it very clearly and please don't think I'm sarcastic.

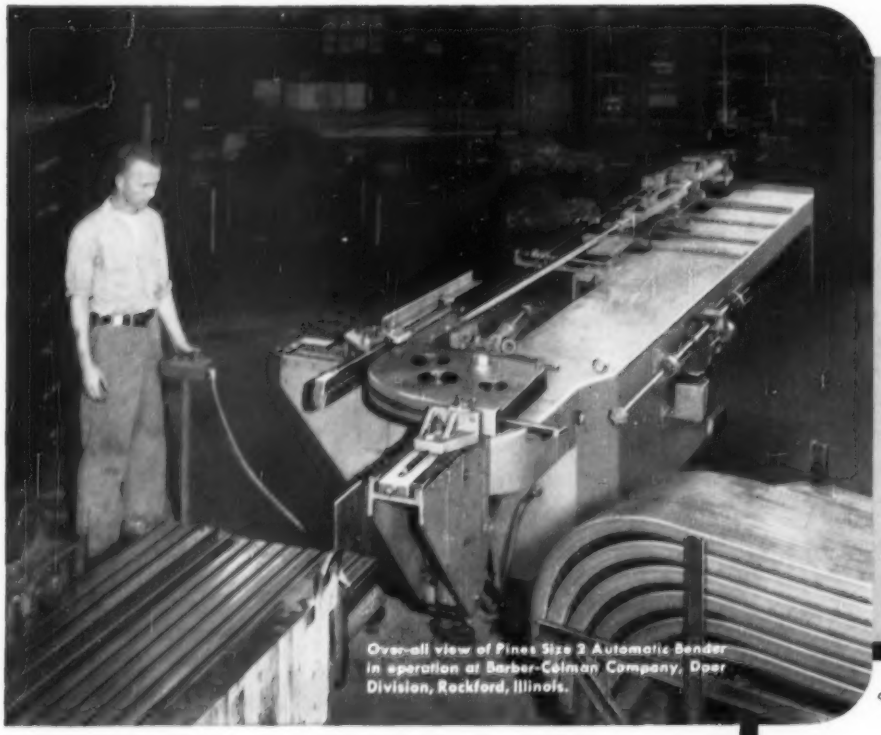
Mr Debtor has all he wants. However, he can't pay his installments. So, somebody must pay them for him, and he asks for higher wages, which he cannot get, because he is making top rate. So he must make

Threads can be no better than the taps you use. That's why it's important to use taps that are as near perfection as it is possible to make them.

"Greenfield's" close control of every measurable element of a tap is your guarantee that you are buying the best that can be made. This accuracy is bound to be reflected in the threads they tap.

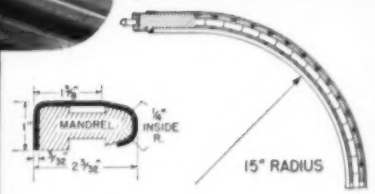
IF IT CAN BE MEASURED **GREENFIELD** *MEASURES IT*

GREENFIELD TAP and DIE CORP.
GREENFIELD, MASS.



Over-all view of Pines Size 2 Automatic Bender in operation at Barber-Colman Company, Door Division, Rockford, Illinois.

Steel Channel Costs Cut 15% AT BARBER-COLMAN CO.



Position of mandrel and workpiece for making R.H. tracks.

L.H. track is formed with opening up.

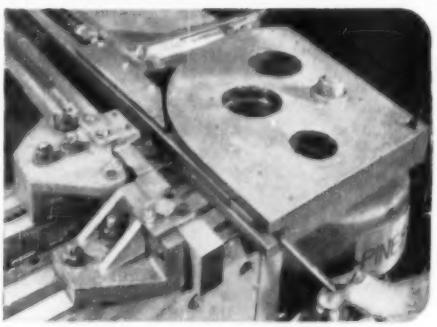
PINES AUTOMATIC BENDER

BOTH L.H. AND R.H. BENDS PRODUCED WITH SAME TOOLING

● Here's another outstanding example of how production bending the "Pines-Way" cuts costs . . . this time for Barber-Colman Company, leading manufacturer of top quality commercial and residential garage doors. By roll shaping door channels from flat stock, then cold bending in a Pines Size 2 Machine, costs have been reduced from 15% to 20%. Formerly, finished channels purchased in lots of 1,000 required extra storage space and a considerable inventory investment to meet the increased demand for "BARCOL" overhead doors. Today, the channels are easily produced as they are needed, which cuts inventory costs, reduces storage and handling problems, and improves delivery.

Smooth, Neat Bends Produced at Production Speeds

As illustrated, 90° bends are formed in HR 13-gauge (.094) steel channels on an inside radius of 15". Of special interest also is that both left and right-hand channels are formed with the same tooling. Smooth, neat bends are produced at production speeds without wrinkling or distorting. As shown in drawing, R.H. tracks are produced with opening down, and L.H. tracks with opening up, which eliminates swing of 8-foot leg. Change in angle specifications are met by the simple angle-of-bend settings on the machine. Setup and operation of machine is handled by semi-skilled machinists.



● Closeup of tooling used for making 90° bend for right-hand track. Flexible mandrel, inserted in channel, insures smooth, wrinkle-free bends. Bending arm speed is 6.0 r.p.m.

Write **FOR MORE DATA ON LATEST COST-CUTTING APPLICATIONS . . .**

If you would like up-to-date case-study data on production bending applied to steel channels, rods, extrusions, pipe or tubing jobs, write for free copies of "Pines News". Or ask for a Pines engineer to call and assist you with any tooling or production problem.

PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery

672 WALNUT • AURORA, ILLINOIS

PRODUCTION BENDING • DEBURRING • CHAMFERING MACHINERY

a promotion. Fancy—he gets that promotion and consequently a raise.

Be honest, folks! What will he do? Of course, pay his debts easier. But I bet you ten to one that this buying maniac is the optimistic type, and he will buy a new car on credit, because he earns more now, instead of getting totally rid of his old debts. As Ed says, there is a lot of temptation, and weak brothers will fall for it. This is the practical side of the problem; there is a moral side too.

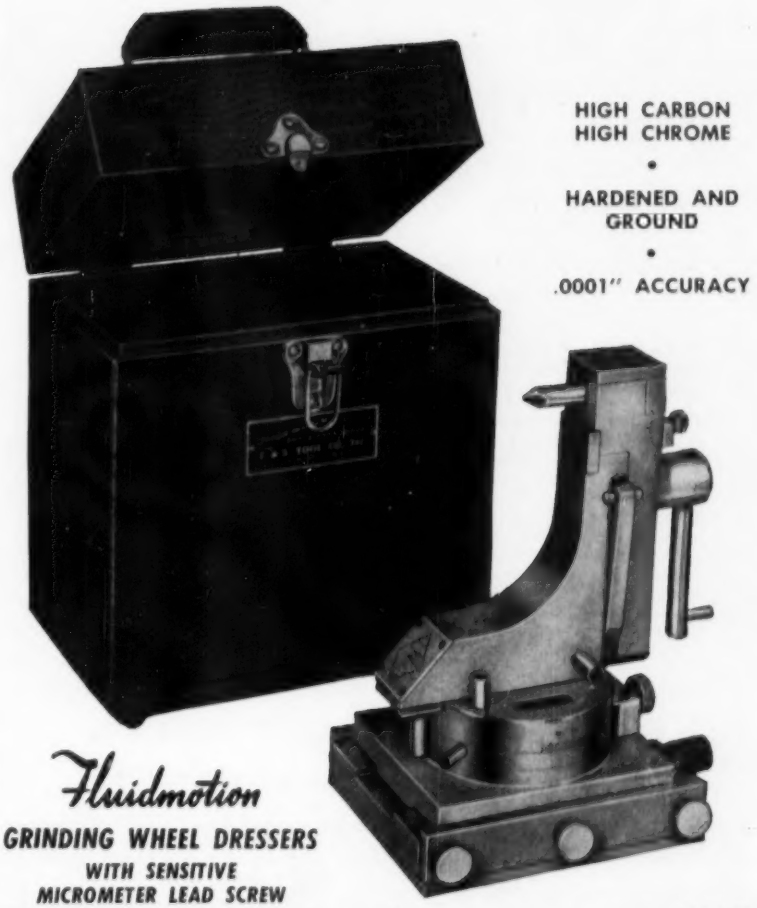
Fancy that the boss wants to help Mr Debtor and gives him his promotion and raise. What about the fellow who didn't go nuts, and acted as a real smart guy, not buying things he can't pay for? Maybe it was his turn to be promoted. Now he must leave his place to a fool who has got to be "helped" in order to save him from disaster owing to the fact that he did not handle his pay with sense and wanted to live like the first millionaire.

I'm sorry, but there is just one remedy for Mr Debtor. Let him tell his creditors, and his wife, he can't pay. The creditors will take his toys away, but it will stop his financial worries. It will prevent him from becoming a thief or a crook. It will most probably save him from jail. Tell him to reorganize his budget like any working man—unless he is swimming in his money—must do. And if he wants to buy on credit, he should only buy so much as he can pay for and still maintain a safety margin so that he is able to meet with unexpected costs if they might occur.

It is still better, if he can produce the moral strength, to resist the temptation until he has saved his spare money so that he can buy cash and get it cheaper too!

Personally I'm fond of TV, especially if I can look at my set with the thought, "It's all mine and paid for!" I know, the missus wants to have what the neighbors have! I'm a married man too, you know. And it is perhaps a very old-fashioned principle (that's what they say in Europe at least) but the husband is responsible, earns the money, and so has to decide whether capital things can be bought—yes or no. And if hubby says no, and can prove his standpoint to be sensible then it is no! Better risk a quarrel with your wife than financial trouble.

So, everybody should live within his pay. It is a social duty. And besides, it earns respect from most people. There will always be stupids who will laugh at you. Let them laugh. When you are looking at your TV, it's paid for. It's all yours. They still have to pay for it,



HIGH CARBON
HIGH CHROME
•
HARDENED AND
GROUND
•
.0001" ACCURACY

Fluidmotion

GRINDING WHEEL DRESSERS
WITH SENSITIVE
MICROMETER LEAD SCREW

Forms wheels to shape easy as ABC

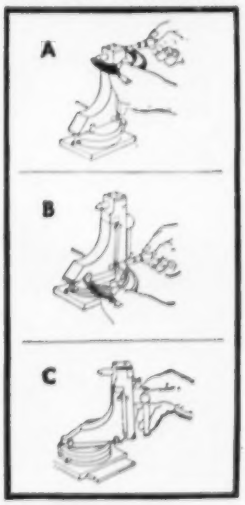
ON INTERNAL • CYLINDRICAL • SURFACE GRINDERS
• TOOL AND CUTTER GRINDERS

With the unique "Fluidmotion" Dresser you can dress two angles tangent to a radius—using one handle in one continuous motion. Operation is so fast and simple that beginners can use them.

Available in several models to form dress wheels from the smallest sizes up to 24" in diameter.

Fully Adjustable, adaptable and semi-automatic in operation, the FLUID-MOTION Wheel Dresser is the only one requiring only a micrometer for setting to obtain any desired form.

Representatives in principal cities of the U.S.



A. Measure over diamond point to back of micrometer plate.

B. Add required convex radius or subtract required concave radius.

C. Tighten gib. Dresser ready for action.

Write for information on the new J & S Purchase Plan.
See your industrial distributor or write for free literature.

J & S TOOL CO., INC.

CLAMPCUT

870 DORSA AVE.
LIVINGSTON, NEW JERSEY

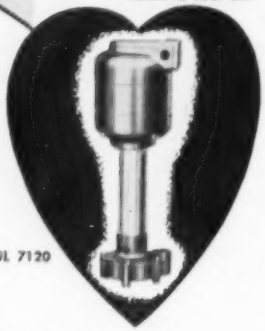
The Heart of a good Coolant System

Ruthman GUSHER Coolant Pump

This 16" Model 280 Springfield Lathe is equipped with a Ruthman "Gusher" Coolant Pump. Photo courtesy Springfield Machine Tool Co.

Yes, a "Gusher" Coolant Pump is truly the heart of a *really good* Coolant System.

A "Gusher" gives you split-second coolant flow without priming. Its simple design eliminates the need for packing, foot or relief valves and it requires less power when throttled. The dynamic balancing of the entire rotating assembly minimizes vibration. The rugged construction with over-sized pre-lubricated ball-bearings reduces attention to a minimum. The result is a *better*, more dependable performance for all "Gusher" Coolant Pumps.

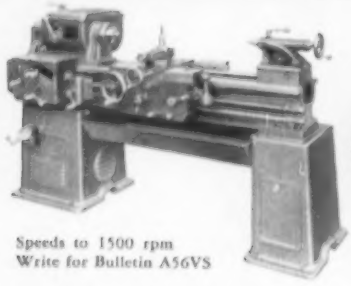


MODEL UL 7120

THE RUTHMAN MACHINERY CO.

1818 Reading Road Cincinnati, Ohio

announcing . . . 2 NEW lathes!



Speeds to 1500 rpm
Write for Bulletin A56VS

16" VARIABLE SPEED ENGINE AND TOOL ROOM LATHE
Model VS

16" GEARED HEAD ENGINE LATHE
Model GH

Spindle speeds to 600 rpm
Write for Bulletin A56GH

Two extraordinarily efficient lathes which enable you to TURN MORE AT LOWEST COSTS

Over 50 Years Lathe Building Experience

THE CARROLL-JAMIESON MACHINE TOOL CO.
BATAVIA, OHIO

through the nose probably. And that's not what you have your nose for.

Mr Editor, I don't flatter myself with the thought that I'm the only sensible fellow alive. However, maybe it will interest you to know how a European thinks about it.

D C van der Wal
Rotterdam, The Netherlands

BUSYBIRD

What do you do with the employee who is continually coming up with suggestions and schemes for bettering production and processes? Is it a sign of an alert mind, or simply a fusser with an enthusiasm complex?

A BUSYBIRD is a threat to the harmony of the shop and a potential troublemaker.

Al is right about the possibility of the eager beaver coming up with a good idea, but the question is, is it worth it? Does the possibility of a suggestion which the company will pay for anyhow give the busybird license to neglect his work? If he does come up with an idea, it may be valuable enough to make up for all the trouble he caused but the company cannot afford to gamble on it. Beavers can cut down lots of trees and have nothing but dead wood to show for it. If it was only the cost resulting from the neglect of his own work it would not be too bad. Unfortunately the real cost is greater than this for the busybird is usually more appropriately referred to by the derogatory title of busybody.

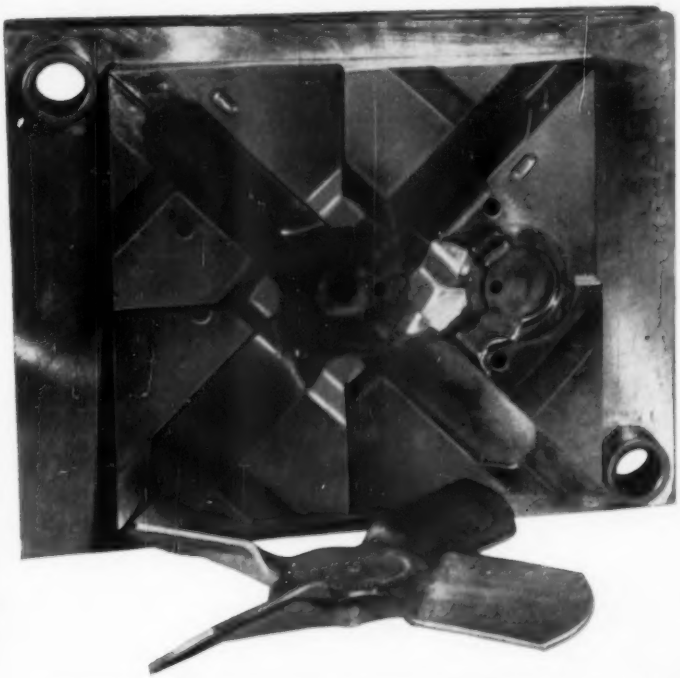
A man who hops around the shop "inspecting" everybody's prints, job, tools, and setups is a usurper. He is usurping the functions of the foreman and even some of the functions

Tool Steel Topics

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation



They're Using Cr-Mo-W Die for Fan Hub Part

Economy and long service life were the chief reasons that led Production Die Casting Company, Houston, Texas, to select Bethlehem Cr-Mo-W tool steel for the manufacture of this hub for an attic fan.

The two-part die, with Cr-Mo-W (chrome-moly-tungsten) used for both sections, is approximately 16 in. x 18 in. The part is cast of aluminum alloy, at 1250 F. Engineers at Production Die Casting Company say, "Performance of this die has been excellent. It has provided long, satisfactory service life."

Cr-Mo-W is an ideal tool steel for applications involving drastic changes in temperature, where heat-checking and shock are a problem.

Cr-Mo-W is our general-purpose type of hot-work tool steel. It hardens in air, and has good red-hardness and good machinability. Your Bethlehem distributor carries it in stock, in sizes to meet your needs.

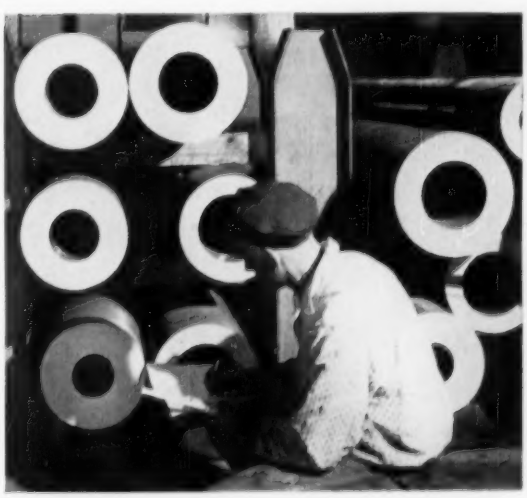
BETHLEHEM TOOL STEEL ENGINEER SAYS:

Smooth Finish in Grinding Improves Tool Life

A smooth ground finish on tools with a cutting edge is essential to good tool life. This was proved recently in an application involving the use of our Lehigh H tool steel in a rotary slitting knife.

In normal operation on hot-rolled strip these knives cut about 8000 tons per edge on the original grind. But after being reground in the mill, production dropped to about 3000 tons per edge. Investigation revealed that the reground finish was rough and coarse, which meant in effect that the cutting edges were already dulled before being used in service. When the same knives were properly reground with a smooth finish, production again averaged 8000 tons per edge.

Generally, a smooth ground finish of from 10 to 15 micro-inches on a profilometer is satisfactory for good cutting-edge performance. In the event that coarser finishes are used, you may find production decreased.



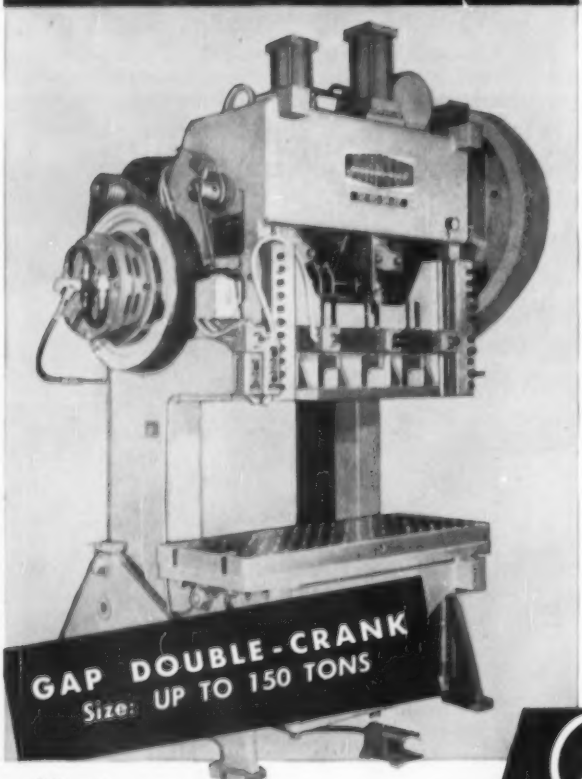
"HOLLOW-BAR" IN TWO TYPES

Bethlehem Hollow-Bar Tool Steel is now made in two types: BTR (Bethlehem Tool Room, oil-hardening), and Lehigh H (high-carbon, high-chrome). Hollow-Bar is made by a high-speed trepanning process, by which hammer-forged or hot-rolled bars are cored out, then rough-turned on the outside. Hollow-Bar is an ideal time-saver on hardened bushings, ring dies, draw-rings and the like because the steel can be put right to work. There's no need to wait for forged rings or discs.

JOHNSON

INTRODUCES

TWO NEW SERIES of PRESSES



- **Box Type Ram**
- **Steel Fabricated**
- **Air Clutch (low inertia)**
- **Electrical Controls**
- **Bronze Gibs and Ball Seat**
- **Air Counter Balance**

Write for Bulletin 1956

Also **22 MODELS OF OBI MECHANICAL PRESSES**
from 16 to 125 Tons Capacity

Johnson MACHINE and PRESS CORP.
620 WEST INDIANA AVENUE • ELKHART, INDIANA

of the other men. If there is a particular problem attached to a job the man working on the job should have the prerogative of submitting the suggestions covering any solutions developed, not the busybird who picked up the idea over the man's shoulder.

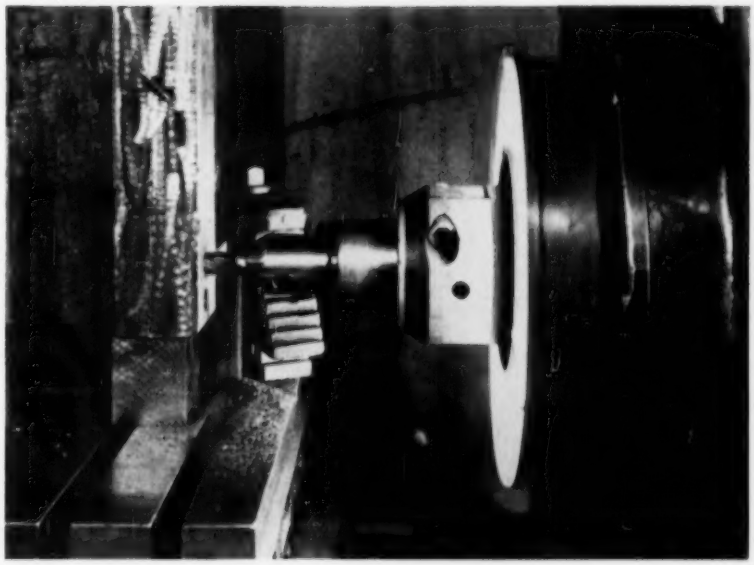
If a man persists in being a busybird, the foreman or supervisor should discharge him for the best interest of the shop.

H G Koslow
Bronx, NY

THE MAN with ideas is one of the most valuable possessions of an organization. The same machines are available to any shop that wants to purchase them. Full information on all the usual standard methods and procedures is readily obtainable by all. Industry is competitive, and the company that gets ahead is the company with ideas—not just a few ideas to start with, but a constant flow of them. The horse that gets ahead and stays there is the one that is sure to win the race. It is not sufficient to take the lead and then coast along, for you can always be sure that the other organizations on the way up are driving forward as hard as possible.

As people become older they become set in their ideas and object to changes because they grow to regard the "old way" as their own way. A company should be glad to get a man who is willing to look, question, and think. Ideas are man's most valuable possession. The machines used by man, and the products produced, wear out and deteriorate. Ideas can

"Please, fellas, don't bang those checkers down so hard!"



Sun-Lite CIRCLINE MACHINE LIGHTS

- Increase Operator Efficiency
- Help Prevent Accidents
- Minimize Costly Errors

CIRCLINE UNITS are one lamp units, designed especially for lighting work areas on rotary spindle type machines, such as boring mills, drill presses and similar machines. 8″, 12″ and 16″ diameter standard Circline lamps are available. Cord is No. 18/3 Neoprene, six feet long, terminating in a plug. For use on 110-118 V. 60 Cy. A.C. Housing is 20 gauge steel finished in baked enamel, gray outside with white reflecting surface inside. A circle of frosted shatterproof Plexiglas, sealed oil-tight, protects the lamps and interior wiring.

ILLUSTRATED **No. CLM16 Circline unit on boring mill. Note light on the vertical surfaces. (Unretouched photo.)**

WRITE TODAY **for bulletin No. 156 containing specifications and installation data.**

Sun-Lite MANUFACTURING CO.

2555 BELLEVUE AVE., DETROIT 7, MICHIGAN

DELTA
ROCKWELL

ROCKWELL-BUILT

Delta 17" Drill Press

Delta 14" Drill Press

Delta 14" Super-Hi Sensitive Drill Press

Floor Models

Bench Models

Multiple Spindle Set Ups

DELTA... world's most complete power tool line
53 machines...246 models...over 1300 accessories

ROCKWELL-BUILT

DELTA drill presses

14"—14" SUPER-HI SENSITIVE—17"

Over 100 Models including Standard or Production Table, Key Chuck or Morse Taper Spindle, High or Slow Speed, Standard or Power Feed—Floor, Bench or Multiple Spindle Set Ups.

INCREASE PRODUCTION

Three basic reasons why Delta Drill Presses increase production: They're VERSATILE—do the work of many expensive single-purpose machines. They're FLEXIBLE—can be used singly or in combination; readily adapted to automated operations. They're PORTABLE—easily moved to the work to reduce materials handling, eliminate bottlenecks.

IMPROVE QUALITY

Delta Drill Presses are *quality* tools, built to turn out quality work. They're precision-engineered for greater accuracy—hold extremely close tolerances, reduce costly rejects. And with Delta's simplified controls, even inexperienced operators turn out fine work.

SAVE MONEY

Delta—power tool pioneer—has both the manufacturing know-how and sales volume to give you highest quality combined with low first cost and low maintenance cost. Save money by using rugged, accurate Delta Drill Presses to supplement—or replace—heavy, expensive machines. See your Delta Dealer—he's listed under "TOOLS" in the yellow pages.

DELTA ROCKWELL

DELTA QUALITY POWER TOOLS

Another Product by **Rockwell**

Send The Coupon For Complete Catalog!

Delta Power Tool Division, Rockwell Manufacturing Co.
618D N. Lexington Ave., Pittsburgh 8, Pa.

- ☐ Please send Delta Industrial Catalog on the complete Delta Drill Press line.
- ☐ Please send Delta "MAKE UP YOUR OWN MIND" fact book.
- ☐ Please send name of my nearest Delta Dealer.

Name _____ Title _____

Company _____

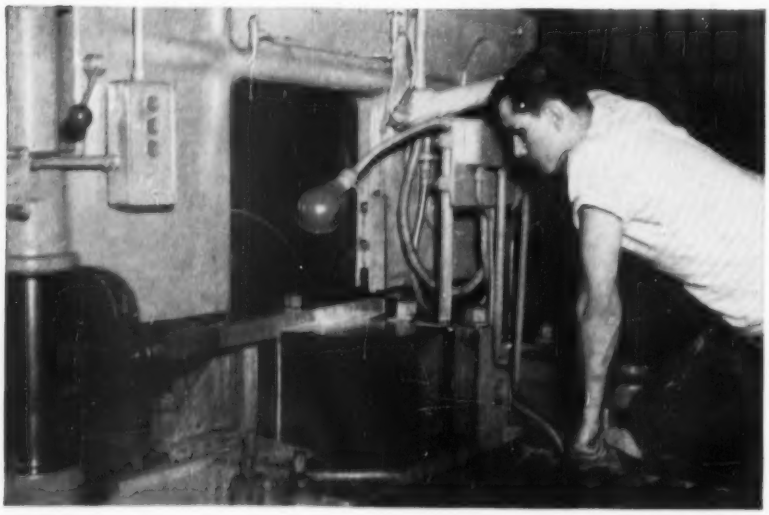
Address _____

City _____ County _____ State _____

BOOST YOUR CUTTING PRODUCTION

WITH BARNES

***ROCKET* POWER BLADES**



Barnes' exclusive manufacturing processes have "locked in" all the basic requirements of a top-quality hack saw blade—AND MORE!

"BARNES ROCKET BLADES," made of quality high speed steel, feature *Gradient Hardness*. The hard cutting teeth blend into a semi-hard flexible back. The result is a one piece blade with outstanding strength and safety, a blade that will withstand sudden shock loading without breaking or shattering. You are sure of a "safe," efficient blade for your toughest sawing jobs.

The inherent strength of "BARNES ROCKET BLADES" requires less tension to assure straight cuts. Elongation is held to a minimum making frequent tension adjustments unnecessary.

You can count on your local BARNES DISTRUBUTOR. The best in blades is immediately available from his stock. Through him, Barnes' up-to-date engineering and research staff stands ready to help you with any sawing problem.

The combination of immediate availability, safety, efficiency and QUALITY can't be beat.

when cutting counts BARNES *count on Barnes*

W. O. BARNES CO., INC.

1297 TERMINAL AVE. • DETROIT 14, MICH.

be recorded, and can spread and become an asset to the entire human race to be passed on to each generation.

It is true that the eagerness of the new employee is somewhat of a problem for Ed because it takes time to listen to all the suggestions and explain why they can or cannot be used. However, if the new man comes up with one good idea it will more than make up for all Ed's efforts. In a shop doing production work a good idea to save a little time can be very valuable. It may result in a very small saving on each piece produced, but when multiplied by the number of parts produced over a period of years the saving becomes tremendous.

Ed and some of the other men may feel that the new man is excessively eager and may find his attitude objectionable. This man is new and is anxious to make a good impression. The best plan is for Ed to accept his suggestions and, if necessary, discuss them. If he continues to come up with ideas which are of no value to the shop he will soon realize that he is building up a poor record and will exercise more care on future suggestions. He will give his ideas more careful consideration before presenting them. This will result in a reduction in the quantity but an improvement in the quality. If his interest and enthusiasm is discouraged at this time he may stop thinking about the work and stop presenting his ideas. This could mean the loss of some good suggestions.

William Sincowski
Brooklyn, NY

"Try moving around and doing a little work in the shop on these cold days . . . You'll be surprised how it speeds up your circulation!"

City _____ County _____ State _____

ELIMINATE SHORT-END SCRAP WITH ASARCON 773 (SAE 660) CONTINUOUS-CAST BEARING BRONZE

Asarco Continuous-Cast Bronze is available in any length you need. You are not bound by the 12-inch or 13-inch standard lengths common to other types of castings. You buy Asarcon Bronzes in exact multiples of your part length plus saw-cut. You pay only for the metal you use.

Parts made from continuous cast bronze have longer life because Asarco's Continuous-Casting process produces alloys of exceptional uniformity. Fatigue characteristics and impact strength are increased as much as 100 percent, and yield strength is up from ⅓ to more than 50% that of the same alloys produced by other casting methods.

Diameters of Asarcon Bronzes now range from ½ inch to 9 inches in any size you need. Many foundry alloys and a variety of shapes are made to order in all of these sizes. Asarcon 773 can be shipped directly from distributors' stocks or from our New Jersey and Indiana plants.

Continuous Cast Products Department

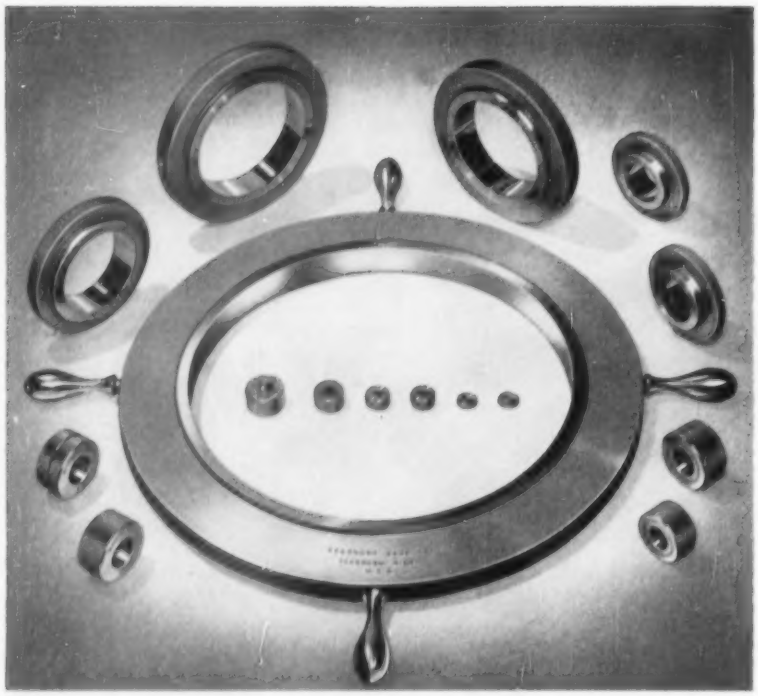
AMERICAN SMELTING AND REFINING COMPANY

Perth Amboy Plant, Barber, New Jersey • Whiting, Indiana

WEST COAST SALES AGENT: Kingwell Bros. Ltd., 457 Minna Street, San Francisco

IN CANADA: Federated Metals Canada, Ltd., Toronto and Montreal

ASARCO



For Finer Accuracy, Higher Quality, Lower Gaging Costs!

DEARBORN MASTER SETTING RINGS MASTER SETTING DISCS

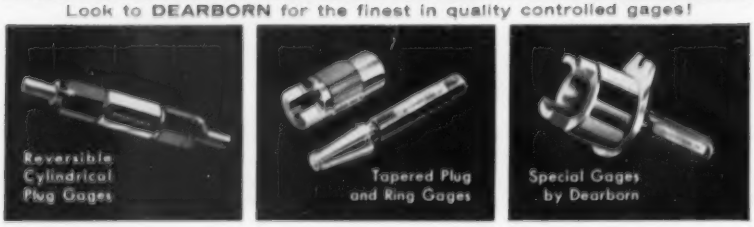
When it comes to controlling internal and external work dimensions, you'll find it pays to set your production and inspection gaging equipment with Dearborn Master Rings and Discs. Produced to A.G.D. Standards, they are made of the finest quality steel . . . stabilized, ground, and precision lapped to specified size. All are subjected to rigid, 100% inspection under closely controlled laboratory conditions to assure the ultimate in uniformity and accuracy. And they are available with either steel or chromium plated gaging surfaces in a wide range of sizes to meet your particular requirements . . . Master Rings from .029" to and including 12.260", Master Discs from .150" to and including 8.510".

IF YOU BUY GAGES, Dearborn's 48-page illustrated catalog is designed to save you time. It's available to Inspection, Production, and Purchasing executives . . . send for it today!

DEARBORN GAGE COMPANY
"Measuring in Millionths for Three Generations"
22038 Beech Street • Dearborn, Michigan

REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE UNITED STATES AND CANADA

Look to **DEARBORN** for the finest in quality controlled gages!



New Books

BIBLIOGRAPHY OF MONOLINGUAL SCIENTIFIC AND TECHNICAL GLOSSARIES—VOL 1, NATIONAL STANDARDS—*By Eugen Wuster. Published by the United Nations Educational, Scientific and Cultural Organization. Unesco Publication No. 300. Available from Book Store, United Nations Bldg, New York. Price, $2.50.*

In this age of growing international communication, multilingual dictionaries have become indispensable for reading and translating, but monolingual technical dictionaries are more important to the precise needs of the engineer, scientist and business organization.

The national standards of the countries concerned give definitions for technical terms. Thereafter, this book is a classified index of standards from 27 countries. Entries under a subject are referred to the Universal Decimal Classification. The material is divided into 10 primary fields and further sub-divided into areas of specialization.

•

EFFECTIVE COMMUNICATION ON THE JOB—*Edited by M Joseph Dooher. Published by American Management Assn, 1515 Broadway, New York 36, NY. 294 pages. Price $5.50.*

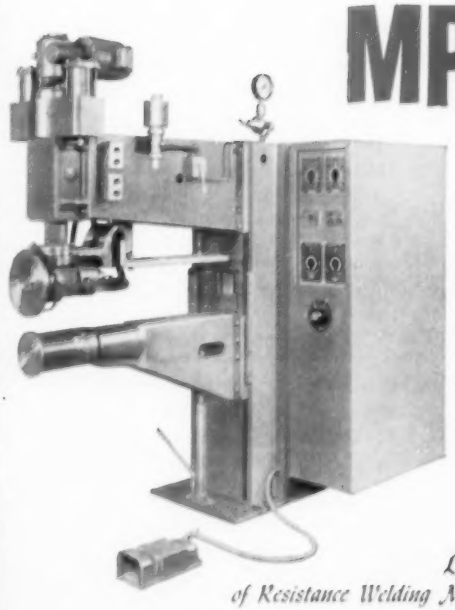
There seems to be new interest in the problems of communication in industry. By communications is usually meant the transfer of ideas, instructions, or information from one person to another: a supervisor to his men, or to his superior, or to another department.

Much of this interest stems from a new realization of how ineffective such communications often are. This guide is a collection of chapters by 22 authors with broad experience in the areas they cover. Major sections deal with person-to-person communications, the roadblocks that exist, day-to-day problems (instructions, orders, reprimands, rumors), communication upwards, rating interviews, grievance interviews, employment interviews, conference leadership, and talks.

While the subject matter would tend to make for a nebulous book full of glittering generalities, the authors seem rather uniformly to have practiced what they preach. The chapters are well organized, full of practical suggestions on procedure.

FOR THE FIRST TIME A COMPLETELY NEW DESIGN OF SMALL, LOW PRICE SCIAKY SEAM WELDERS

Featuring all the Ruggedness, Dependability and Consistency of Operation Common to Sciaky Basic Thinking—Welders Designed to Do More Useful Work at Lower Operating Cost with Maximum Reliability!



MP-2 AIR OPERATED, PRESS TYPE, LOW IMPEDANCE, SINGLE PHASE SEAM WELDER

Through advanced design, volume production tooling and complete use of integrated parts, Sciaky has been able to add a seam welder to its line of competitively priced, small, standard welders. Check these important design features . . .

Pneumatic Double-Acting Cylinder Head
Low Inertia, Anti-Friction Bearing Guided Ram
Side Mounted Sciaky Integral Control
Low Impedance Secondary Circuit
Sciaky High Efficiency Welding Transformer
Copper Alloy, Fully Adjustable Lower Arm
Silver Plated, Laminated Flexible Shunt Conductor
Simple, Positive Internal Gear Drive

For complete details and specifications on the MP-1 seam welder write for Bulletin 321-7.

Largest Manufacturers of Resistance Welding Machines in the World

SCIAKY®

SCIAKY BROS., INC. • 4933 W. 67th STREET • CHICAGO 38, ILLINOIS

SHELDON
U. S. A.

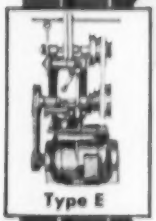
MORE POWER
at the Spindle Nose

The greater work capacity of 10", 11" and 13" Sheldon Precision Lathes comes in part from their extra power. Compared to other lathes of similar swing and price, Sheldon Lathes are built to take larger motors. Sheldon Motor drives are better engineered and better built. In place of a single ordinary V-belt to drive the lathe spindle, these Lathes have twin, Neoprene, cog V-belts (each capable of delivering 40% more power than an ordinary V-belt).

The greater wrap-around of Sheldon's twin cog V-belts not only delivers more power at the spindle nose—permitting heavier cuts, they also eliminate slippage at the spindle—increase accuracy of work. Made of oil, heat and static resistant Neoprene, Sheldons Spindle belts have a longer life expectancy than other belts of similar type.

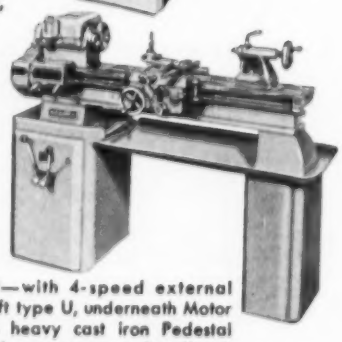
Write for New G-55 Catalog

EM56B—with 4-speed Type E, Underneath Motor Drive in Cabinet base.

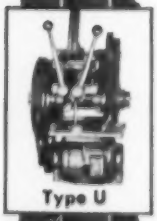


Type E

See our display at the Western Metal Show, Booth 614



UM56P—with 4-speed external lever shift type U, underneath Motor Drive in heavy cast iron Pedestal base with storage space in tailstock leg.



Type U

SHELDON MACHINE CO., Inc.

4234 N. Knox Ave. • Chicago 41, Illinois

New Films

PROCESS CHARTS, *U-3515. Produced by Bureau of Audio-Visual Instruction, Extension Div, State University of Iowa, Iowa City, Iowa. 16 mm, black and white, sound. Running time 16 min. Rental $2.50, purchase $60.00.*

One of a group of four films intended as training material in time and motion study, this first unit shows the purposes, preparation, and use of process charts and flow diagrams in business and industry. Through analysis of a specific work operation—setting a dinner table—it shows how a process chart is made, and how work can be simplified systematically through its use. The construction of a flow diagram for the process is illustrated, and its function in helping to visualize the total work situation is discussed.

•

MOTION STUDY PRINCIPLES, *U-919. Produced by Bureau of Audio-Visual Instruction, Extension Div, State University of Iowa, Iowa City, Iowa. 16 mm, black and white, sound. Running time 27 min. Rental $4.00, purchase $75.00.*

This fourth film of a group for training in time and motion study defines and illustrates the most common fundamental hand motions. It shows both the old and improved methods of performing such operations as filling a pinboard, inserting papers in mailing envelopes, folding paper cartons, and assembling refrigerator grids.

•

MAN-MACHINE CHARTS, *U-3552. Produced by Bureau of Audio-Visual Instruction, Extension Div, State University of Iowa, Iowa City, Iowa. 16 mm, black and white, sound. Running time 22 min. Rental $2.50, purchase $75.00.*

Second of a group of four films designed for time and motion study training, this unit describes the construction and use of a man-machine chart. In developing better ways to work, activities are encountered here where a man and machine work together. The chart records the activities performed by the man and the machine, side by side on a sheet of paper. These are then studied to see if they can be rearranged or simplified for more effective use of the

FOR THOSE TOUGH *Special* JOBS
...DEPEND ON

National Tool Co.

Representatives in major industrial centers

● Years of successful experience in *special* tooling and related production problems are yours for the asking. When the job requires *special* cutting tools call in your National Tool Co. representative. He is backed by more than 49 years experience in the engineering and manufacture of *special* cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

Since 1905 engineers and manufacturers of high-quality special cutting tools for the metal-working industry

National Tools Cleveland

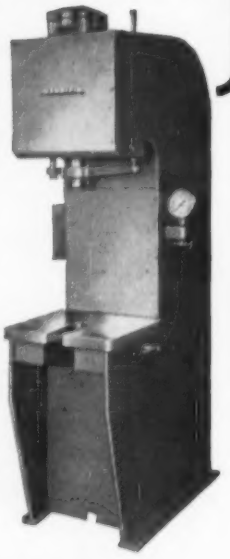
National
TOOL CO.
Cleveland 2, Ohio

PRICE LIST

ON HANNIFIN STOCK HYDRAULIC PRESSES

1-TON	$ 552
2-TON	$ 627
5-TON	$1,306
8-TON	$1.356
10-TON	$1,855
25-TON	$3,401

Prices complete with motors and starters F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.



DELIVERY FROM STOCK

Demand for these popular presses is so consistent we are able to produce them in quantity and pass the savings along to you.

Construction-wise and quality-wise these small general-purpose presses are identical to the larger Hannifin presses, up to 150 tons. Special, optional controls when needed.

WRITE for complete information on the Hannifin Hydraulic Press you're interested in.

HANNIFIN

HANNIFIN CORPORATION, 517 S. WOLF ROAD, DES PLAINES, ILLINOIS

FOR LESS THAN $40 YOU GET 12 SETS, EACH SET GROUND READY TO GO

Men would not accept either idea at first . . .

INSERT CHASERS SAVE UP TO 33%

Insert chasers are like safety razor blades: they cost so little that you can throw them away when dull. Or, for utmost economy, you can resharpen them over and over again. Only a flash grind is required. For less than $40 you get a dozen sets of ¾–16 insert chasers, each set ground ready to go. You will be amazed at the quantity of threads they will cut, even to Class 3 specifications, with a minimum of downtime. FREE: "Selecting the Proper Die Head for the Job"

THE EASTERN MACHINE SCREW CORPORATION 20-40 Barclay St., New Haven, Conn.

time of each. Work manuals to accompany the film are available at $0.35 per copy.

•

MOTION STUDY APPLICATIONS, *U-979. Produced by Bureau of Audio-Visual Instruction, Extension Div, State University of Iowa, Iowa City, 16 mm, black and white, sound. Running time 17 min. Rental $4.00, purchase $75.00.*

Number three of a film group designed for time and motion study training, this unit presents eleven principles of motion economy with the following three applications to illustrate them: Bolt and washer assembly, refrigerator doorknob assembly, folding X-ray film packing papers.

•

A MODERN FABLE. *Produced by Clearing Machine Corp, Div US Industries Corp, 6201 W 63rd St, Chicago 38, Ill. 16 mm, color, sound. Running time 20 min.*

Based on the company's line of automatic transfer presses, this film uses both animation and direct camera work to explain in detail the operation of a transfer feed press. It should prove highly informative to engineers, production men, and executives in the metalworking field.

•

PRESSURE ON METALWORKING PRODUCTION. *Produced by Lake Erie Engineering Corp. PO Box 68, Kenmore Station, Buffalo 17, NY. 16 mm, color, sound. Running time 25 min. No charge.*

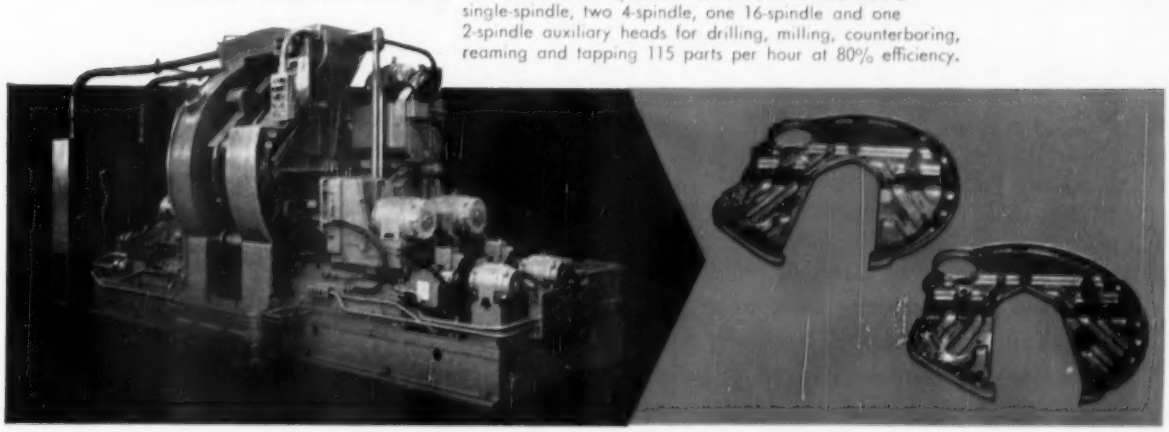
Demonstrating the technique of forming metal into a desired shape by pressure, rather than by the removal of chips, the film shows action shots of hydraulic presses at work for stretch-forming, cold extrusion, flanging, forging, drawing, and forming. Close attention is given to die setup, stroke and pressure adjustments, and long- and short-stroke work.

The difference between single-, double-, and triple-action presses are illustrated by actual presses and animated sequences. Also discussed are the advantages of heavy construction, extra-capacity oil reservoirs, forged-steel cylinders, engineered hydraulic piping system, quick-set stroke controls, and simplified electrical system.

BARNESDRIL

UNIT MACHINES
GUARANTEE
CONTROLLED PRODUCTION-RATE

BARNESDRIL SPECIAL UNIT-MACHINE with 6-station rotary index. Machine is tooled with 2 single-spindle, two 4-spindle, one 16-spindle and one 2-spindle auxiliary heads for drilling, milling, counterboring, reaming and tapping 115 parts per hour at 80% efficiency.



BARNESDRIL SPECIAL DOUBLE-END TRUNNION MACHINE for drilling, chamfering and tapping holes in aluminum housing adaptor plate at the rate of 70 parts per hour, 80% efficiency. Tooling includes two 16-spindle, one 11-spindle and one 10-spindle auxiliary head, and one 6-spindle and one 13-spindle lead screw tapping units.

send for complete catalog, bulletin 1504

These are Typical Examples —
of BarnesdriL Engineering Skill in combining a specified number of production operations into a single automatic cycle, to produce a required rate of production.

A wide range of work operations is available through the flexibility of rotary index, lateral index, drum index or work transfer mechanisms. Units adapt themselves to vertical, horizontal or angular arrangement. Call your BarnesdriL representative for recommendations on your production-rate problems.

MOLE BARNESDRIL FINISHING

BARNES DRILL CO.

830 CHESTNUT STREET • ROCKFORD, ILLINOIS

Doing the Hole Job-

Better, Faster, at Lower Cost

BESLY TAPS

with UNSURPASSED ACCURACY at all vital points

Tru-Square DRIVER

Mirror-Finish FLUTES

Solid Ground THREAD FORM

Accurate RAKE ANGLE

Microcentric CHAMFER

You get better threaded parts, longer tap life and lower tapping costs when you use Besly Taps in your shop. The correct tap design plus Besly's unsurpassed accuracy, make the difference, both in production quality and costs.

PUT BESLY ON TRIAL . . .

ask your Besly Distributor to put the right Besly Tap on your toughest job. There's no cost or obligation to actually see what Besly taps can do for you. When you call him, be sure to get the details on Besly's Super-Service on "specials".

BESLY **BESLY-WELLES CORPORATION**

120 Dearborn Avenue • South Beloit, Illinois

Est. as C. H. Besly & Co.

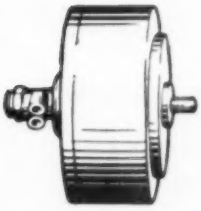
Names in the News . . .

R L Bobo, regional sales manager for Federal Pacific Electric Co, has been appointed manager of the Cleveland, Ohio, regional plant. He will continue as Great Lakes sales manager

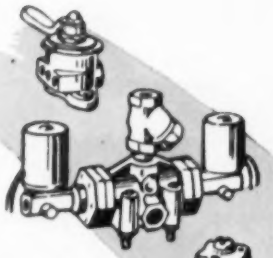
W E Brainard, former assistant to the vice president of manufacturing at Hughes Aircraft Co, has been appointed chief engineer of the aircraft machine tool division of Kearney & Trecker Corp

William C Cawthon has been promoted to the post of general superintendent of Dodge car manufacturing. He was formerly engineer in charge of body and special engineering operations. Dodge manufacturing promotions: **Cecil N King,** general superintendent, foundry, to foundry manager; **Rudolf G Schmalenberg,** general superintendent of machining, to methods manager; **John Van Dam,** assistant general superintendent, machining, to general superintendent, machining; **Raymond Larson** succeeds Mr Van Dam. Engineering staff promotions: **R D Engle,** assistant chief engineer, to chief engineer, car operations; **S J Tompkins,** chief engineer, truck design, to chief engineer, truck operations; and **George W Gibson,** supervisor of paint and trim engineering,

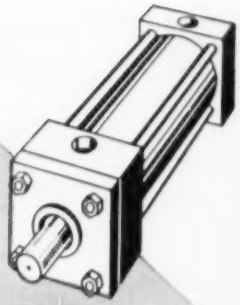
(Continued on page 277)



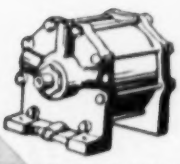
ROTATING AIR CYLINDERS



HYDRAULIC AND AIR VALVES



LOGANSQUARE AIR CYLINDERS



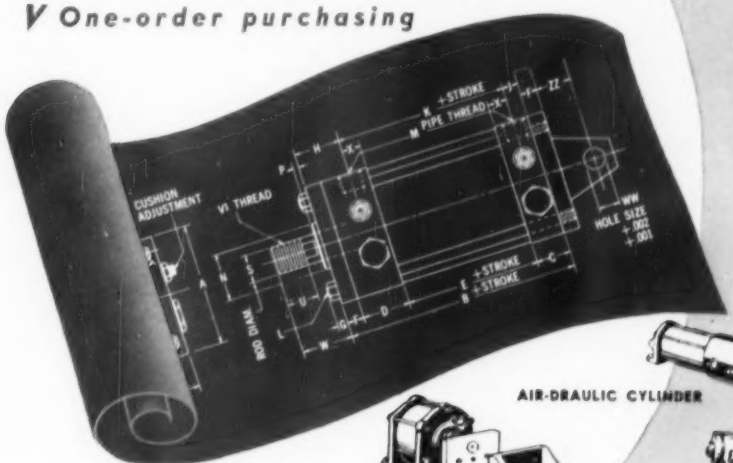
NONROTATING AIR CYLINDERS

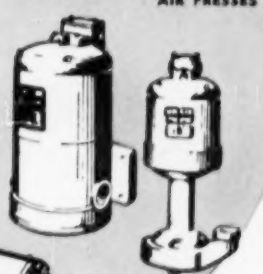
specify . . . Logan

YOUR DEPENDABLE *"ONE-SOURCE"* SUPPLIER FOR ALL YOUR AIR AND HYDRAULIC EQUIPMENT..

- *One-manufacturer responsibility*
- *One-source manufacturing*
- *One-order purchasing*

HYDRAULIC AND AIR PRESSES

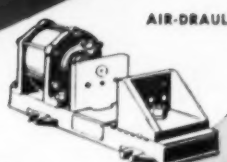




AIR-DRAULIC CYLINDER

SURE-FLOW COOLANT PUMPS

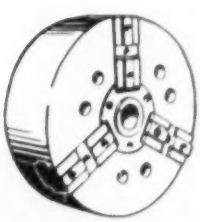
ROTOCAST HYDRAULIC CYLINDERS



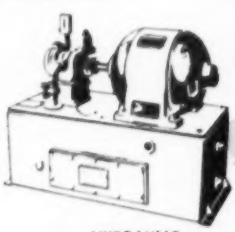
AIR-OPERATED VISES AND FIXTURES

MEMBER: Natl. Mach. Tool Builders' Assn., Natl. Fluid Power Assn.

RETURN THIS COUPON FOR FREE ENGINEERING DATA



AIR AND HYDRAULIC OPERATED CHUCKS



HYDRAULIC POWER UNITS

PROPERLY DESIGNED . . .
PROPERLY EQUIPPED BY

Logan

Logan YOUR DEPENDABLE "SINGLE SOURCE" For All AIR or HYDRAULIC Equipment

LOGANSPORT MACHINE CO., INC.
818 CENTER AVENUE, LOGANSPORT, INDIANA

PLEASE SEND COPY OF CATALOG:

- ☐ 100-1 AIR CYLINDERS
- ☐ 100-2 MILL-TYPE AIR CYLS.
- ☐ 100-3 AIR-DRAULIC CYLS.
- ☐ 100-4 AIR VALVES
- ☐ 100-5 LOGANSQUARE CYLINDERS
- ☐ 100-5-1 ULTRAMATION CYLINDERS
- ☐ 51 PRESSES
- ☐ FACTS OF LIFE
- ☐ 62 SURE-FLOW PUMPS
- ☐ 200-1 HYD. POWER UNITS
- ☐ 200-2 ROTOCAST HYD. CYLINDERS
- ☐ 200-3 750 SERIES HYD. CYLINDERS
- ☐ 200-4 HYD. VALVES
- ☐ 200-5 FITTINGS
- ☐ 70-1 CHUCKS
- ☐ ABC BOOKLET
- ☐ CIRCUIT RIDER

TO:

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

Madison Men cover every

Here's how **MADISON** *can solve your hole problems*

MADISON applications

MADISON range

typical MADISON tools

BORING

Diameters 1" up

For rough boring, MADISON Roughing Bars are available in sizes to properly handle the complete range of MADISON Rough Boring Cutters. Only MADISON features Free Cutting Action and One-Screw Adjustment.

REAMING

Diameters 5/8" up

For finishing a hole to size with close tolerance and good finish, use the MADISON Reaming Tool. The MADISON feature of Interchangeability and Controlled Float are inherent in every MADISON Tool.

You buy more than just hole-making tools when you buy MADISON Tooling. You get the knowledge and experience of MADISON'S veteran tool engineers. This service is available to you at all times. These experts, whose chief concern is inner diameters, are on the job to lower tool costs and increase production for you. To get their unbiased recommendations, submit a part-print or sketch of hole problems. The men with holes in their heads will then see to it that you get the right MADISON tool for your applications.

phase of **Inner Diameters**

Diameters 5/32" to 2"	Diameters 2" up	Diameters 1/4" to 12"	Diameters 3/4" up
For producing truer, more accurate, finer finished holes, in one operation from the solid through gun-drilling techniques, use MADISON Deep Hole Drilling Tools. Unexcelled for both deep and shallow drilling applications.	Where relatively large diameters are to be produced from solid stock, use MADISON Trepanning Tools. Through solid-core removal, faster cycle time, saving of material and reduction of horsepower requirements are realized. Depth of hole is unlimited.	To obtain a mirror-smooth burnished surface in any cylindrical bore, regardless of length, use MADISON-FAESSLER Roller-Burnishing Tools. Micrometer adjustment. Self feeding. Quick, simple operation.	For checking the accuracy of the hole produced, use MADISON Adjustable Boregages. Sets available in individual combinations or to cover the complete range of holes. Speeds gaging operation, cuts gage inventory cost. Ease of setting provides rapid change in size or tolerance.

MADISON

MADISON
MANUFACTURING CO.
INDUSTRIES, INC.
–FAESSLER TOOL CO.
MUSKEGON, MICHIGAN

"inner diameters are our business"

MADISON MANUFACTURING CO.—Dept. AM-Muskegon, Michigan
Please send me MADISON literature on:

☐ Adjustable Boring Tools ☐ Precision Drills ☐ Roller Burnishing Tools
☐ Adjustable Reaming Tools ☐ Trepanning Tools ☐ Adjustable Boregages

NAME TITLE

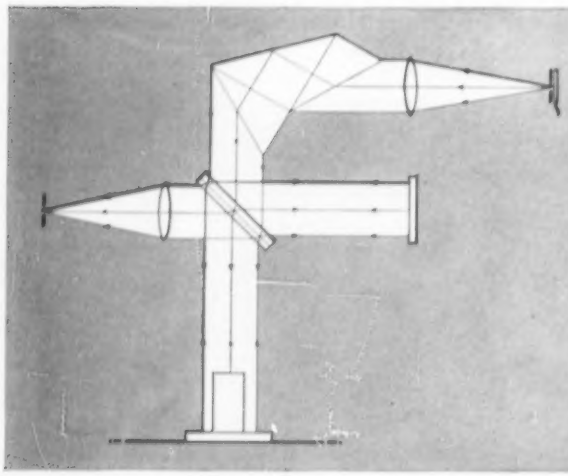
STREET

CITY ZONE STATE

A NEW DIMENSIONAL AUDITING SERVICE FOR INDUSTRY

A Standards Laboratory—America's first commercial dimensional Standards Laboratory has just been dedicated in Dayton by The Sheffield Corporation.

The Eli Whitney Metrology* Laboratory was designed, constructed and equipped in accordance with the experience and standard practices of the great national laboratories of the United States, Great Britain, France and Germany. Thus, this new "Bureau of Standards" is qualified to supplement the work of the governmental laboratories in calibrating and certifying dimensional standards for industry.



Here, also, dimensional audits of precision mechanical components are made—audits not practicable except with the equipment and under the unmatched accurately controlled environment of this Standards Laboratory.

Here, overall dimensional control programs are developed for individual manufacturers—gage surveillance operations worked out in detail.

Here, key personnel responsible for dimensional control can study the philosophy of high precision—can get the feel of high precision equipment and become familiar with the procedures involved.

As to the Laboratory's name—what could be more fitting than to honor that illustrious pioneer, Eli Whitney?

It was Eli Whitney who taught the world the practical value of consistent dimensional precision as the essential of interchangeable parts manufacture.

It was Eli Whitney who thereby introduced our modern era of mass production and economic abundance.

It was Eli Whitney's achievements which demonstrated the blood relationship between dimensional precision and product quality.

The Eli Whitney Metrology Laboratory now takes its place as industry's ally in carrying on this tradition.

For a more comprehensive account of the facilities and capabilities of this unique Laboratory, write for Bulletin ML 1-56. Dept. 1

Metrology—The science of measurement.

GOLDEN ANNIVERSARY

SHEFFIELD

Manufacture and Measurement for Mankind

7440

THE SHEFFIELD CORPORATION · DAYTON 1, OHIO, U.S.A.

to assistant chief engineer, car operations.

Dr Miles V Hayes, previously head of the research departments of United Aircraft's Helicopter Section, has been appointed by Jones & Lamson Machine Co to its staff for long range development studies.

John E Carroll has been elected president of American Hoist & Derrick Co, St Paul, Minn. **Robert J Stoddard** has been appointed executive vice president; **Donal B Botkin** and **Donald S Laughlin,** are new vice presidents.

George Goepfrich, chief engineer of Skinner Chuck Co's Electric Valve Division, has been appointed director of engineering and development for the company. **Robert B Clay,** assistant chief engineer of the Division, takes over Mr Goepfrich's former post.

Edward T Ragsdale, general manufacturing manager of General Motors Buick Motor Division, has been appointed general manager of the division. He succeeds **Ivan L Wiles,** elected an executive vice president of GM in charge of dealer relations.

John P Bunce, staff assistant to the vice president of manufacturing at Kearney & Trecker Corp, has been named to the post of assistant works manager for manufacturing operations at the firm's standard machine division plant.

Richard H Olson has been appointed general manager of Sundstrand-Denver, a division of Sundstrand Machine Tool Co. He was formerly vice president and manager of Sundstrand International Corp, in charge of the firm's European and Pan American operations.

Myron W Rhoten, European Territory sales manager for Allis-Chalmers Manufacturing Co's Tractor Group, has been appointed managing director of Allis-Chalmers Great Britain Ltd, A-C subsidiary with headquarters in Essendine, England. He succeeds **E J Mercer,** who returned in January to become general manager of the Tractor Group's Construction Machinery Division.

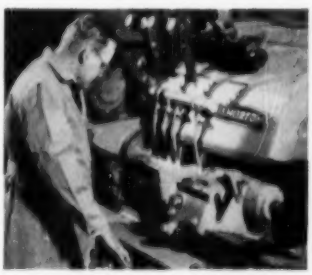
Dr M Eugene Merchant, assistant director of research for Cincinnati Milling Machine Co, has been appointed by the National Advisory Committee for Aeronautics to its

W&B LUBRICANTS AND COOLANTS IMPROVE EVERY GRINDING JOB!

Sixty-seven solid years of *specialized experience* stand behind White & Bagley Grinding Lubricants and Coolants. Here are some of the W & B products that are *boosting production, reducing grinding costs,* and *producing better finishes* for more and more plants throughout the world:

W & B Lubricant 1888 insures rapid and clean stock removal; keeps wheels open and free-cutting; permits the use of finer wheels to produce smooth finishes.

W & B Grinding Concentrate 1500 transparent and foamless; gives unusually keen grinding action and rapid chip settling; for grinding ferrous metals.

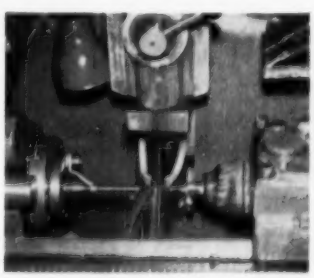


Courtesy, Norton Company

W & B Grinding Lubricant E-1 produces the highest reflective finish; permits rough grinding and finishing with the same wheel.

W & B Grinding Oil 1572 for close-tolerance, critical oil grinding; especially desirable on machines which perform a wide range of oil-grinding operations.

W & B Base L adds potency (sulphur and fat) to petroleum or cutting oils to give improved results in grinding and machining.



Courtesy, Jones & Lamson

Let us help you with *your* needs for grinding lubricants and coolants. We specialize in *your* requirements. For further information, mail the coupon today!

THE WHITE & BAGLEY CO.
Worcester, Mass. Detroit, Mich.
Originators of Grinding Lubricants

W+B INDUSTRIAL LUBRICANTS

The White & Bagley Company
Worcester, Mass.
Please send us more complete information on

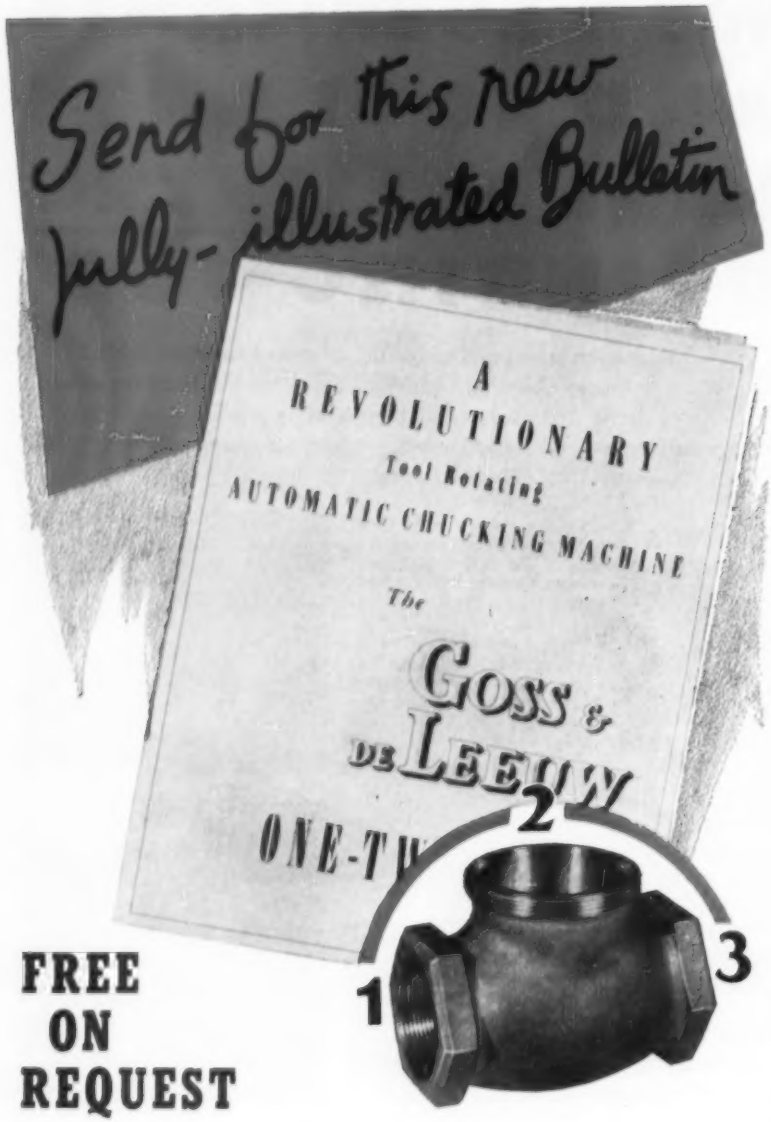
☐ 1888 ☐ 1500 ☐ E-1 ☐ 1572 ☐ Base L

Name_____ Title_____

Company_____

Street_____

City_____ Zone____ State_____



FREE ON REQUEST

Here are the answers to most of your questions as to what "ONE-TWO-THREE" means in describing this outstanding development of Automatic Chucking Machines by Goss and De Leeuw. You'll be interested not only in the revolutionary design of the machine itself, but also in its extraordinary performance—and how it is possible to handle from one to three operations—in sequence or simultaneously—without changing set up.

Get this interesting, informative Bulletin NOW—by merely asking for it.

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

sub-committee on Lubrication and Wear. Dr Merchant has also been named a member of the International Institution for Production Engineering Research.

F B Tannehill, formerly associated with Automatic Electric Co, Chicago, as supervisor of methods engineering, has been named chief industrial engineer of Axelson Manufacturing Co, Division of US Industries, Los Angeles.

J P Hamm, manager of Western Machinery Co's central sales office at San Francisco, has been named assistant to the president of the company.

A F Brown, vice president and general manager of the Calcor Corp, Los Angeles manufacturer of aircraft parts and missile assemblies, has been elected president of the firm. He will retain his duties as general manager.

R G Dragar has been named chief engineer for York-Gillespie Manufacturing Co, builder of special automatic and semi-automatic machinery. He was formerly associated with Mackintosh-Hemphill Co as chief draftsman.

W P Downey has been promoted to the post of supervising engineer of Hyster Co's Straddle Truck Division, Portland, Ore. He succeeds **H Noel Dimick,** who has retired.

Ted C Ruzicka has been appointed machine tool sales manager for Moore-Handley. He will be in charge of the company's sales organization covering the states of Tennessee, Alabama, northwest Florida, and part of Mississippi.

George C Rodgers has been appointed manager of the engine and compressor department of American Air Filter Co, Louisville, Ky. He has been serving with the Herman Nelson Division of the company as manager of military products.

Captain G W Brooks, USN (Ret), has been appointed executive assistant to the general manager at Sargent Engineering Corp, Huntington Park, Calif.

John C McGreivey has been appointed industrial sales manager for the New York division of Behr-Manning, division of Norton Co, Troy, NY. He succeeds **A F Lehnhardt.** Mr

(Continued on page 282)

SUBLANDS

OFF THE SHELF!

ALL TYPES ...
ALL SIZES ...
ALL SHANKS ...

SUBLAND

- DRILL CHAMFER
- DRILL COUNTERBORE
- DRILL REAMER
- DRILL DRILL

Delivery in Ten Days

WRITE FOR COMPLETE CATALOG

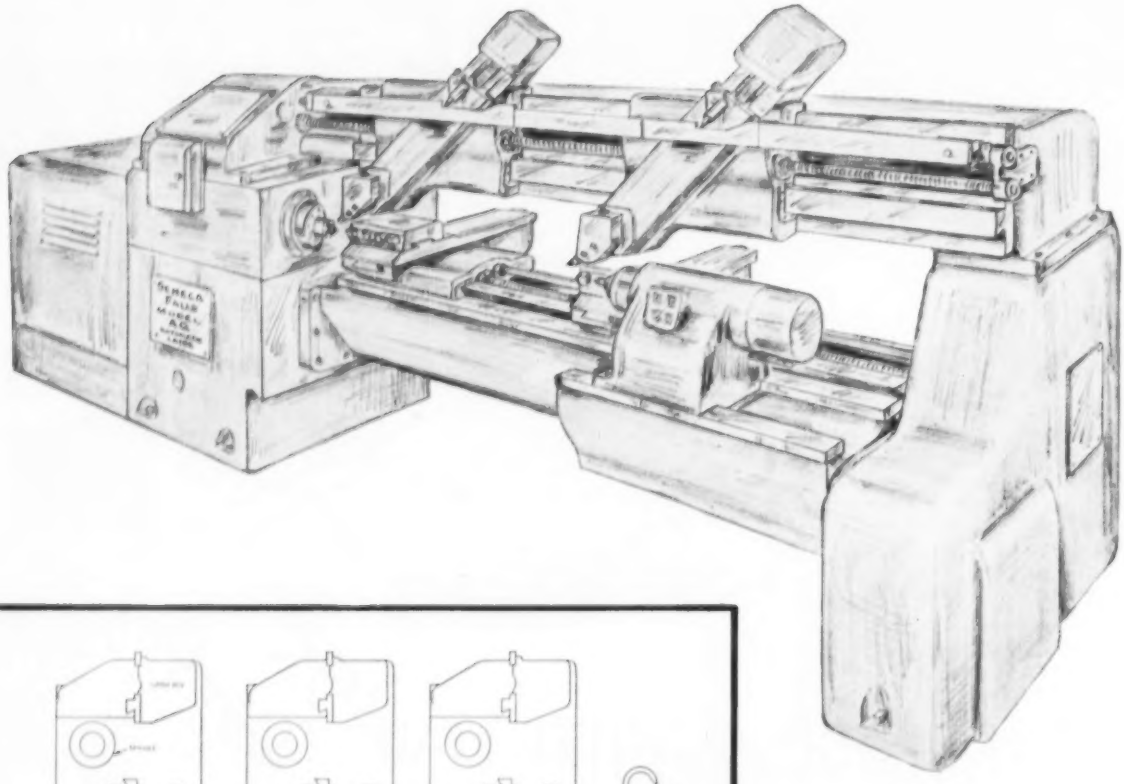
Mohawk
TOOLS, Inc.
910 E. MAIN ST., MONTPELIER, OHIO

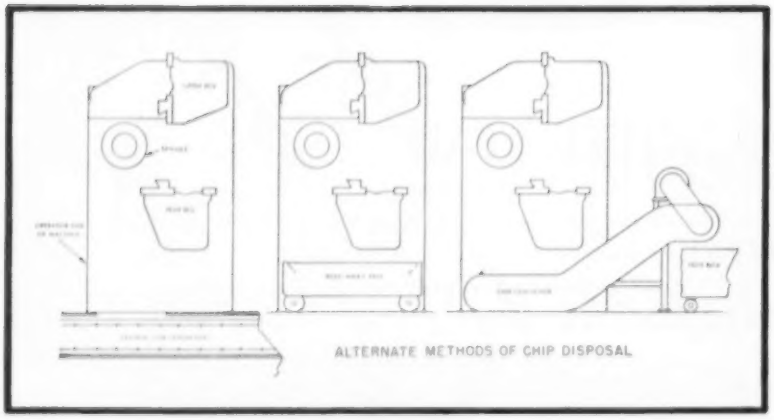
world's largest producer of Sublands

MACHINE OF

PREPARED BY THE SENECA FALLS MACHINE CO. "THE *So-swing* PEOPLE" SENECA FALLS, NEW YORK

A BETTER METHOD OF MACHINING REAR AXLE, AND OTHER SHAFTS





SENECA FALLS
MODEL AQ AUTOMATIC
LATHE, 60 H. P.
NET WT. 20,080 LBS.
ALSO
MODEL LQ. 30 H. P.
NET WT. 8,900 LBS.

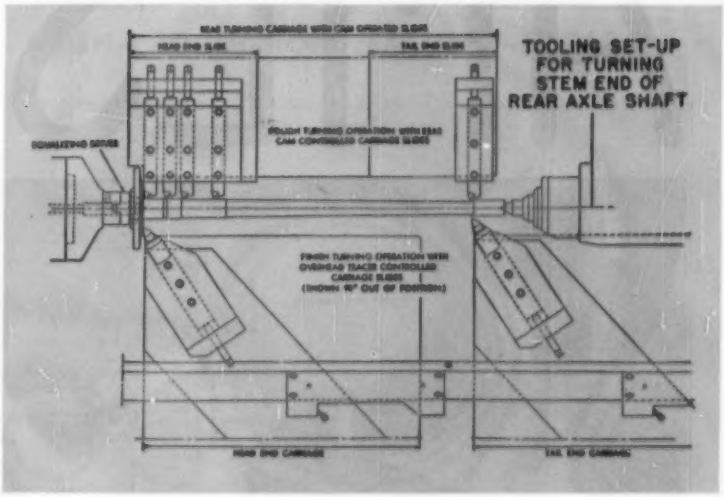
NEW SENECA FALLS

THE MONTH

● The new Models LQ and AQ Seneca Falls Automatic Lathes are designed to combine the best and fastest methods of rough and finish turning shafts on a single machine without removing the work and without attention on the operator's part.

The roughing operation is accomplished with multiple tools on a rear carriage while finish turning is done with single, tracer-controlled tools on each of the two overarm carriages. Thus the advantages of multiple tooling for stock removal and single tool tracer turning for accurate finish operations are combined. By this method extremely close tolerances are maintained since the pressure of the single tool is constant over the entire length of the work piece, and full advantage can be taken of the higher cutting speeds now possible with the newer carbide and oxide tool materials.

The machining operation is completely automatic...the operator loads shafts between centers and pushes the starting button; multiple tools rough turn; tracer tools then finish turn; and finally the machine stops with all tools returned to starting position.



A similar type lathe is used for the flange turning operation. Varying application of multiple tooling or single tracers to either rear or overarm carriages is possible on these lathes and complete "in line" automation can be engineered to specific production requirements.

SENECA FALLS MACHINE CO., SENECA FALLS, N.Y.

WRITE FOR BULLETIN AX 56A

DESIGN FEATURES

- ▶ **Simplified changeover features for reduced set-up time.**
- ▶ **Feed rate may be automatically changed during cutting cycle.**
- ▶ **Streamline design for efficient chip guarding.**
- ▶ **Screw feed to all carriages.**
- ▶ **Four speed head with automatic change-over.**
- ▶ **Large chip flow area.**
- ▶ **All templates clear of chip area.**
- ▶ **All ways hardened, ground and replaceable.**
- ▶ **Open front design facilitates loading and unloading.**
- ▶ **Straight line diameter adjustment for tracer tools...no shoulder length change to correct.**

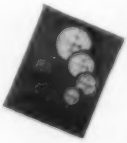
MODEL LQ AND AQ AUTOMATIC LATHES

AMES

. . . the preferred on every job
for time-saving accuracy and dependability

Ames instruments have been making industrial measurement history for more than half a century. Extremely adaptable, they have solved hundreds of tough measuring jobs while providing unquestioned accuracy through many millions of cycles. Ames indicators and gauges enjoy a reputation as the finest you can buy . . . simply because we have *always* employed expert craftsmen and the highest quality materials.

We will gladly make recommendations on your measurement problems. Please send prints and specifications. And ask for your free copy of the Ames catalog.



Representatives in principal cities

B.C. AMES CO.

26 Ames Street, Waltham 54, Mass.

MANUFACTURER OF MICROMETER DIAL GAUGES • MICROMETER DIAL INDICATORS

McGreivey has been engaged in tape products sales for the company. **William J Sweeney,** sales manager of the Los Angeles division, has been named sales manager of the Pacific region. He succeeds **Paul S Wiswell,** who is retiring. **Frederick D Stevens** takes over Mr Sweeney's former duties.

Robert L Groves has been appointed a European district manager of Warner & Swasey Co. He will direct sales of W&S machine tools and textile machines throughout the continent from Paris headquarters.

Hicks B Waldron has been appointed manager of manufacturing engineering for General Electric Co's Distribution Assemblies Department. He will make his headquarters at the Plainville, Conn, plant. **Robert G Page** has been named manager of the North Hollywood, Calif, plant of the department.

Elbert M Palmer, executive vice president of the Kewanee Boiler Division of American Radiator & Standard Sanitary Corp, has been named president of the division. He succeeds **Wm Bradford Russell,** who is retiring from active service.

William I Matthes, vice president of operations for Arwood Precision Casting Corp, Brooklyn, N Y, has been elected executive vice president.

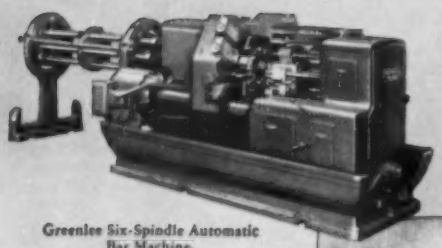
Robert L Collins, supervisor of the manufacturing engineering services section for Ford Motor Co's Ford Division, has been appointed manufacturing manager of the Special Products Division.

W A Paterson, sales manager of the Heater Division of Eaton Automotive Products Ltd, London, Ontario, has been appointed vice president and general manager of the company. He succeeds **Arthur C Pullen,** who has resigned.

Thomas M Butler, chief development engineer for Burroughs Corp, has been appointed to the new post of director of engineering.

Erich Gobien has been appointed general methods engineer at Kurt Orban Co, Jersey City, NJ, importer of German machine tools.

M R Westover, general sales manager of Bohn Aluminum and Brass Corp, Detroit, has been appointed assistant to the executive vice president.

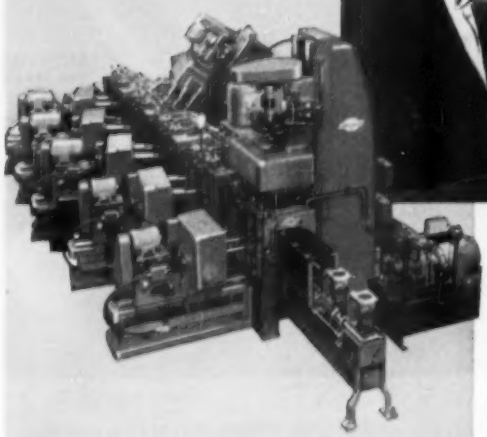


Greenlee Six-Spindle Automatic Bar Machine.

GREENLEE OFFERS

A PROFIT-MAKING INVESTMENT IN HIGH-PRODUCTION MACHINE TOOLS

Greenlee 22-Station Automatic Transfer Machine for machining transmission cases.



Greenlee creative thinking, Greenlee engineering and Greenlee experience combined with that of your own engineers will help you "produce more at lower cost."

Ideas, engineering, experience and facilities of Greenlee Bros. & Co. develop improved methods and machines for greater and greater productivity of future models.

Greenlee's adequate facilities expedite the transition from production ideas to production machines . . . a profit-making investment at work in your plant.

Greenlee 10-Station Automatic Transfer Machine.

GREENLEE STANDARD AND SPECIAL MACHINE TOOLS

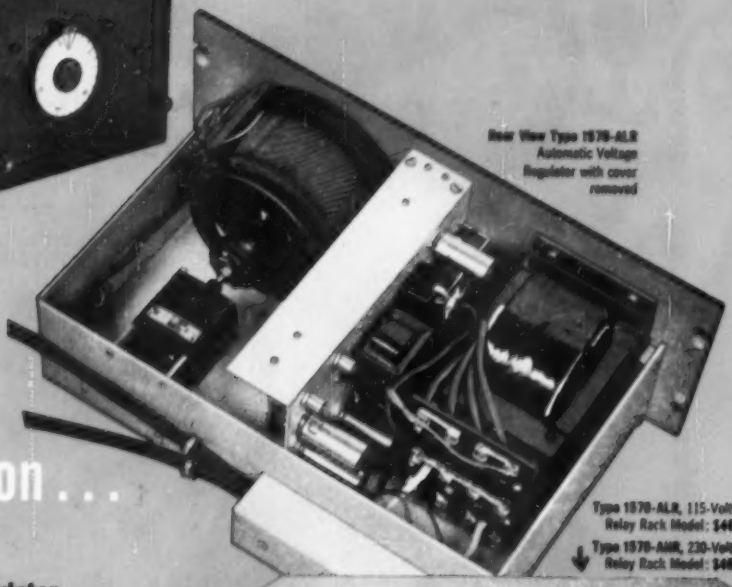
- Multiple-Spindle Drilling and Tapping Machines
- Transfer-Type Processing Machines
- Six and Four-Spindle Automatic Bar Machines
- Hydro-Borer Precision Boring Machines

Write for Further Information

GREENLEE

GREENLEE BROS. & CO.
1724 Mason Ave.
Rockford, Illinois

Type 1570-ALR, 115-Volt, Table Top Model: $465.00
Type 1570-AHR, 230-Volt, Table Top Model: $465.00



Rear View Type 1570-ALR Automatic Voltage Regulator with cover removed

for Really *ACCURATE* *Automatic* Line-Voltage Regulation . . .

Type 1570-A Automatic Line-Voltage Regulator

Type 1570-ALR, 115-Volt, Relay Rack Model: $465.00
Type 1570-AHR, 230-Volt, Relay Rack Model: $465.00

- ★ Voltage Held Constant to ±0.25%
- ★ High Response Speed: 10 Volts Per Second
- ★ Output Voltage Adjustable to ±10% of Input
- ★ No Waveform Distortion
- ★ No Power Factor Restrictions
- ★ High Capacity: 50 Amperes (6 KVA)
- ★ High Efficiency: 98%
- ★ No Relays — No Transient Pulses — No Chattering

The G-R Type 1570-A Automatic Line-Voltage Regulator basically consists of a ball-bearing VARIAC autotransformer that adjusts the output voltage, a 'buck-or-boost' step-down transformer that effectively multiplies the power rating of the VARIAC, and a servomechanism system that positions the VARIAC.

Most automatic voltage regulators use vacuum tubes, saturable core devices or mechanical systems as the regulating elements. The new G-R Regulator avoids all of the disadvantages inherent in any of these systems.

This regulator is available in three models for both 115- and 230-volt lines. It is proving very valuable both in the laboratory and in industrial operations where automatic voltage regulation is necessary.

Write for the G-R Voltage Regulator Bulletin

Type 1570-ALW, 115-Volt, Wall Model: $465.00
Type 1570-AHW, 230-Volt, Wall Model: $465.00

INPUT VOLTAGE RANGE

Output Voltage	Nominal Adjustable ±10% 115 Volts		230 Volts	
Input voltage as a percentage of output voltage*	90% to 110%	80% to 120%	90% to 110%	80% to 120%
Output current amperes	50	25	20	10
KVA	6	3	5	2.5
Accuracy in % of output voltage	0.25%	0.5%	0.25%	0.5%
Speed of Response volts per second	10	20	20	40

*Types 1570-AL and 1570-AH can be connected for either ±10% or ±20% input voltage range. Instruments are shipped connected for ±10% range unless 20% range is specified on order.

WE SELL DIRECT
Prices are net, FOB Cambridge or West Concord, Mass.

GENERAL RADIO Company

1915-1955

275 Massachusetts Avenue, Cambridge 39, Massachusetts, U. S. A.

40 Years of Pioneering in Electronics

50 West Street NEW YORK 6
4555 13th St., Silver Spring, Md. WASHINGTON, D. C.
York Road & Germany Avenue, Abington, Pa. PHILADELPHIA
920 S. Michigan Ave. CHICAGO 5
1000 N. Seward St. LOS ANGELES 38

E.F.* is your ace-in-the hole!

For internal grinding . . . for *all* grinding operations, BAY STATE'S exclusive **E**lectronic **F**ormulation process assures superior accuracy in specification, manufacturing, and duplication of grinding wheels.

This new electronic "brain" precisely calculates the ingredients for every wheel you order, assuring uniform wheels *exactly* as specified for your grinding needs.

CALL IN YOUR BAY STATE DISTRIBUTOR FOR FULL ENGINEERING BENEFITS.

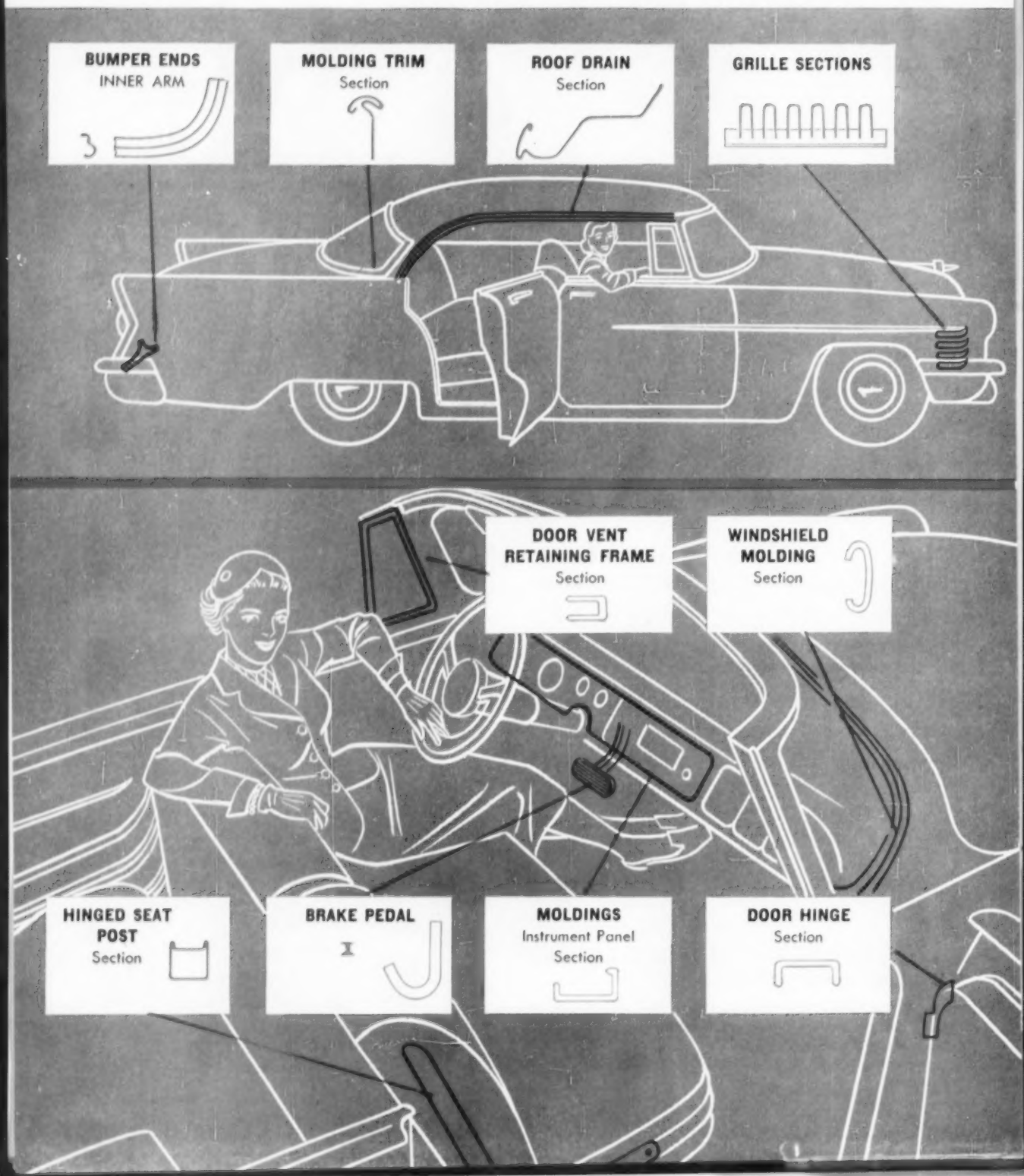
Send for this illustrated booklet.

BAY STATE ABRASIVE PRODUCTS CO.
Westboro, Mass., U. S. A.

Branch Offices and Warehouses —
Bristol, Conn.; Chicago, Cleveland, Detroit, Pittsburgh.
Distributors — All principal cities
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

BAY STATE ®
WHEELS of PROGRESS

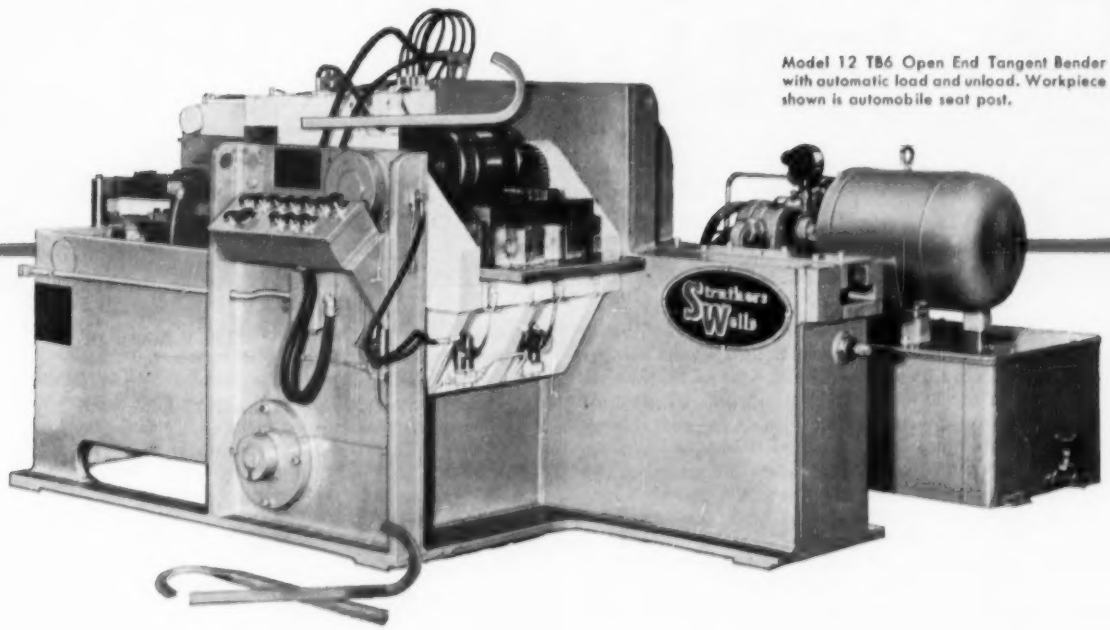
Now available to the Automotive Industry! .....



Struthers Wells ... TANGENT BENDING

of structural parts

For New Production Speed and Economy



Model 12 TB6 Open End Tangent Bender with automatic load and unload. Workpiece shown is automobile seat post.

Struthers Wells Tangent Bending of preformed material—industry's most modern aid to fast, economical metal styling—is now available for automotive production lines. After intensive development and use in appliance manufacture, Tangent Bending is ready for the most efficient automated processes in the automotive industry, eliminating many present wipe bending problems and high tool maintenance. For full information on the Tangent Bending potential for your own operations, send drawings and anticipated production requirements to us in strict confidence. Our recommendations will go forward promptly, without obligation.

STRUTHERS WELLS CORPORATION

Machinery Division **TITUSVILLE, PENNSYLVANIA**

Offices in Principal Cities

STRUTHERS WELLS PRODUCTS:

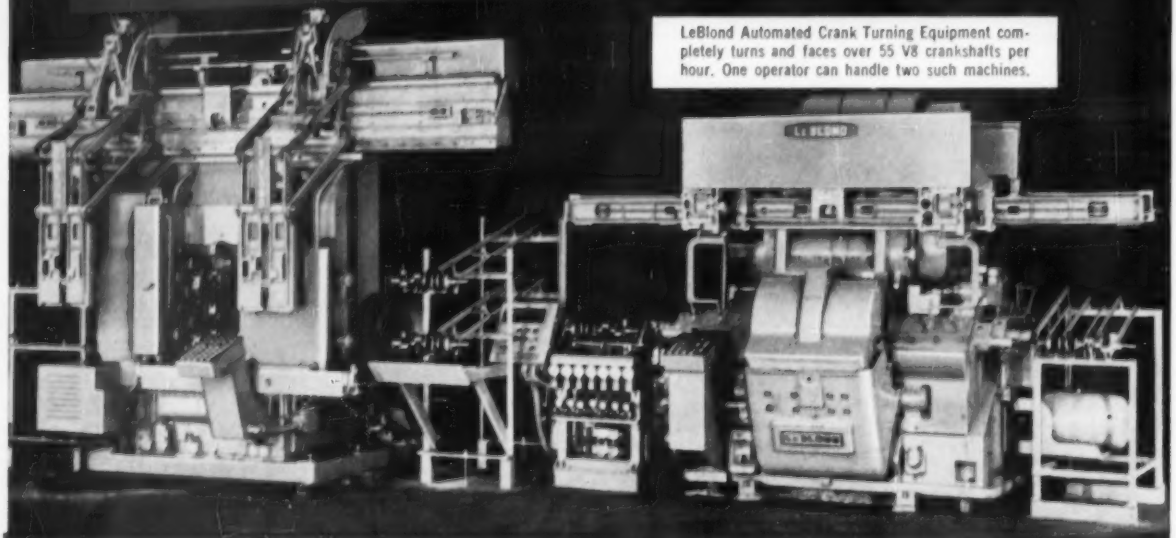
BOILER DIVISION
BOILERS for Power and Heat . . . High and Low Pressure . . . Water Tube . . . Fire Tube . . . Package Units

FORGE DIVISION
Crankshafts . . . . Hydraulic Cylinders Pressure Vessels . . . Shafting . . . . Straightening and Back-up Rolls

PROCESSING EQUIPMENT DIVISION
Crystallizers . . . Direct Fired Heaters . . . Evaporators . . . Heat Exchangers . . . Mixing and Blending Units . . . Quick Opening Doors . . . Special Carbon and Alloy Processing Vessels . . . Synthesis Converters

MACHINERY DIVISION
MACHINERY for Sheet and Structural Metal Forming . . . Tangent Benders . . . Folding Machines . . . Roller Table and Tumble Die Bending Machines . . . Press Brakes . . . Punching and Notching Machines . . . Forming Dies

ANOTHER EXAMPLE OF VICKERS® Hydraulics



LeBlond Automated Crank Turning Equipment completely turns and faces over 55 V8 crankshafts per hour. One operator can handle two such machines.

in AUTOMATION

This new LeBlond Automated Crank Turning Equipment machines crankshafts at an exceptionally high rate. All operations of the Models LBA and PBA machines shown above are hydraulic with the exception of the actual rotation of the crank . . . here a Vickers hydraulic motor is used for braking and jogging the electric motor drive. All hydraulic power is supplied by Vickers Pumps and controlled by Vickers Valves.

In addition to the advantages inherent in hydraulic control, Vickers Hydraulics gives you the benefits of a nation-wide and full-time field engineering and service organization to assure correct application and operation with least maintenance. Vickers has the complete line of hydraulic equipment necessary to take undivided system responsibility . . . to eliminate any risk of incompatibility of hydraulic components.

The Vickers Application Engineer near you will be glad to demonstrate the many benefits you can obtain by using Vickers Hydraulics. Write for a copy of Catalog 5001A.

VICKERS INCORPORATED

DIVISION OF SPERRY RAND CORPORATION

ADMINISTRATIVE and ENGINEERING CENTER

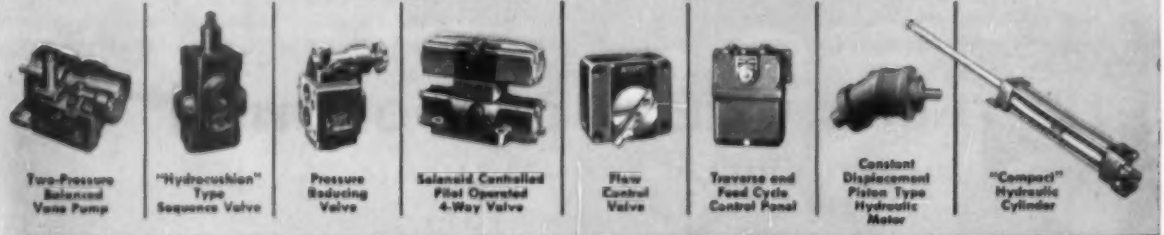
DEPARTMENT 1410 • DETROIT 32, MICHIGAN

Application Engineering Offices:

ATLANTA • CHICAGO • CINCINNATI • CLEVELAND • DETROIT
HOUSTON • LOS ANGELES AREA (El Segundo) • MINNEAPOLIS
NEW YORK AREA (Summit, N.J.) • PHILADELPHIA AREA (Media)
PITTSBURGH AREA (Mt. Lebanon) • PORTLAND, ORE.
ROCHESTER • ROCKFORD • SAN FRANCISCO AREA (Berkeley)
SEATTLE • ST. LOUIS • TULSA • WASHINGTON • WORCESTER
IN CANADA: Vickers-Sperry of Canada, Ltd., Toronto

7301

Representative Standard VICKERS Units Used on LeBlond Automated Crankshaft Lathe



Two-Pressure Balanced Vane Pump | "Hydrocushion" Type Sequence Valve | Pressure Reducing Valve | Solenoid Controlled Pilot Operated 4-Way Valve | Flow Control Valve | Traverse and Feed Cycle Control Panel | Constant Displacement Piston Type Hydraulic Motor | "Compact" Hydraulic Cylinder

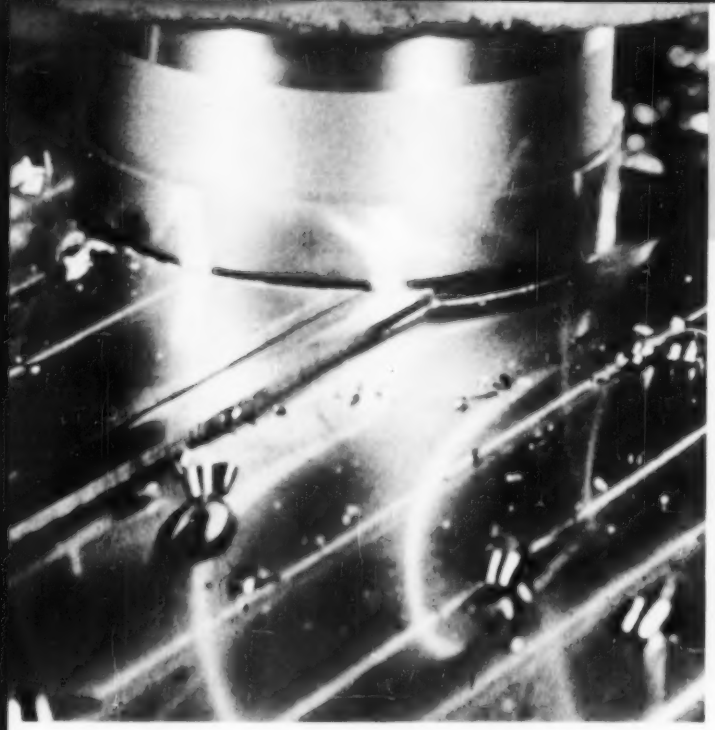
ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

and Low Pressure . . . Water Tube . . . Fire Tube . . . Package Units

Pressure Vessels . . . Shafting . . . . Straightening and Back-up Rolls

. . . Special Carbon and Alloy Processing Vessels . . . Synthesis Converters

Bending Machines . . . Press Brakes . . . Punching and Notching Machines . . . Forming Dies



carbide NEWS

WESSON development cuts tool costs, down time and inventories in milling and boring

Throw-Away Insert Milling Cutters Eliminate All Grinding

A revolutionary new approach to carbide milling has been developed and is announced by Wesson Company, Detroit, with the introduction at the Tool Show in Chicago of Wesson Throw-Away insert milling cutters. These cutters, which like Wesson Throw-Away insert holders never require sharpening, are designed to handle the majority of all rough and finish milling operations on cast iron and steel.

Employing low-cost disposable Wessonmetal blades have eight quickly indexible cutting edges, the Wesson Throw-Away insert milling cutters provide a broad range of advances in milling practices. Following are some of the characteristics:

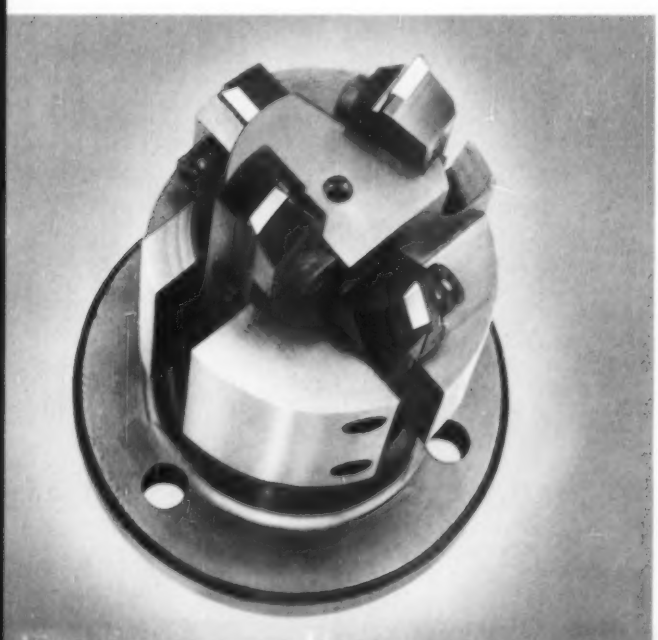
1. **High Speed Milling**—The design of the throw-away insert milling cutter permits high speed milling at high feeds. Negative radial and axial rake combinations provide ample clearance and give eight cutting edges on square blades.

2. **Low Tool Cost**—Blade cost is as little as 17 cents per cutting edge. By elimination of grinding, cost per piece is lower.

3. **Quick Setup**—Elimination of grinding and any need for complicated blade adjustment make rapid blade indexing possible, resulting in drastic reduction in set up time.

4. **Inventory Reduction**—Since cutters do not have to go back to cutter grind for re-sharpening, excess reserve inventory of cutter bodies is not required. Cutters, in some cases, can be maintained right at the machine. Efficient milling of both cast iron and steel, possible with the same cutter body using different carbide grades, also reduces inventory costs.

(continued on page 2)



Throw-Away insert boring tools were the second step in Wesson's evolution of a complete throw-away tool line. In use for more than a year these boring tools helped prove the applicability of the throw-away principle to multiple point and rotary tools.

carbide NEWS

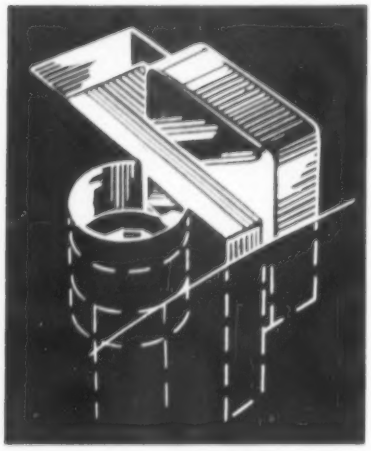
Throw-Away Insert

(Continued from page 1)

5. Standard Drive—In addition to their many advantages, Wesson Throw-Away Insert milling cutters can be used with present adapters and machines eliminating special conversion cost.

If you missed this revolutionary new development at the Tool Show or saw it and want more details, write Wesson today for complete illustrated literature.

Ask for Bulletin WC-356.



Assembled view of Throw-Away insert milling cutter blade, locking wedge and socket head screw shows rigidity achieved by full face bearing of the hardened steel locking wedge on the solid carbide tip.

New Holders Designed for Offset Machining

A new line of indexible carbide insert tools for offset turning and facing has been added by Wesson. Available in four sizes and right or left hand offset styles, holder models GAR and GAL are listed as semi-standard tools by the company.

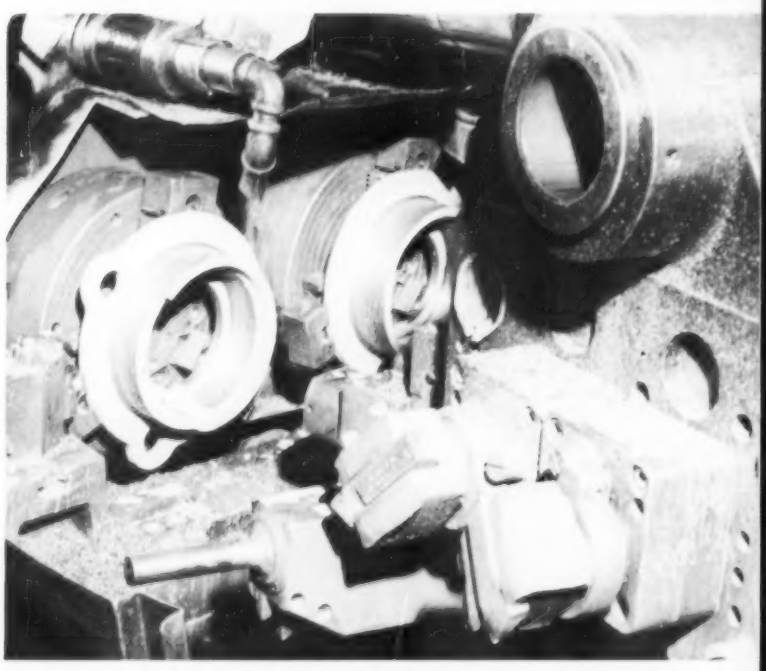
Extensive field tests have proved the economy of the indexible insert offset holder over conventional offset tool types in reduced changeover time.

Ask for Bulletin GAR-GAL to get additional details of the new holder line.

tools Wesson carbide Wessonmetal

WESSON COMPANY DEPT. AD
1220 Woodward Heights Blvd., Detroit 20, Mich.
IN CANADA: WESSON CUTTING TOOLS, LTD.
93 LEICESTER AVE., TORONTO 18, ONTARIO

Carbide Insert Tooling Slashes Machining Costs, Boosts Output



Output of final drive pinion bearing cages jumped from 40 to 400 per grind after change to solid carbide insert holders.

Production of tractor final drive pinion bearing cages jumped from 40 to an average of 400 pieces per grind and tool cost per piece dropped from $0.19 to $.0034 when a midwestern builder of road machinery switched to carbide insert-type holders at two stations on rough and finish machining operations. Wesson tools are used at all stations.

Rough and finish turning, facing, boring and chamfering of the bearing cages are performed on a 25 hp two spindle Potter & Johnson automatic turret lathe in five operations with two bearing cages being machined per set-up. The new insert-type tooling on four positions at stations #2 and #4, and brazed-type single point tools on all other positions use Wessonmetal Grade GS for roughing and Grade GI for finishing.

Average depth of cut for all roughing operations is $\frac{1}{8}$". All roughing and finishing operations are being done in three feeds—.008", .012" and .018". Speeds used are 220 sfm for roughing and 380 sfm for finishing.

New No-Grind Tool Holder Bulletin Issued

Advantages and mechanical features of the new Multicut series of Throw-Away insert tool holders are described and illustrated in Bulletin No. 5510-M available from Wesson. Sketches and photographs are used to show holders, principal components and typical operations in which each of the six basic styles of holders are used. All holders are available from stock for either right or left hand use.

Separate tables for each holder give the sizes available, shank dimensions, prices of the holders only, insert catalog numbers and insert dimensions.

A large, illustrated composite table gives detailed information on the anvil locators, carbide tipped and steel clamps, taper head screws and clamp locking screws used with the various sizes and styles of the new Multicut holders. Also included are illustrations and tabular information on the standard round, square and triangular Wessonmetal Throw-Away inserts used with the various holders.

principle to multiple point and rotary tools.

cut it with stop

BAND SAW BLADES

75 CAPEWELL ANNIVERSARY

SOLD ONLY THROUGH CAPEWELL DISTRIBUTORS who provide: complete inventory . . . engineering assistance . . . delivery when you need it.

THE CAPEWELL MANUFACTURING COMPANY
Hartford 2, Connecticut

Please send complete details on Capewell Band Saw Blades to:

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

2CA5

Check Seals for flatness....

...with VK **LIGHT WAVE EQUIPMENT**

Van Keuren Light Wave Equipments, standard gage laboratory equipment everywhere, have long been used for checking gage blocks, toolmaker's flats, comparator anvils and other lapped surfaces in the laboratory or inspection room. In recent years, however, VK Light Wave Equipments and flats have become valuable tools on production inspection jobs. Typical is the growing use of optical flats in checking sealing rings of various materials.

The illustration at right of a sealing ring under a 3" diameter fused quartz optical flat shows how easily measurements can be made. The ring* is acceptable on sight. The bands indicate excellent surface finish (sharp definition of bands), and no warp or low edges (uniform band spacing). Flatness is within .000005" across entire ring, and .000002" across ring face (bands curve less than ½ band interval over entire ring, and 1/6 over ring face).

*Product of Sealol Corp., Providence, R. I.

VK Optical Flat and Seal Ring

Send for a copy of the new, 258-page Van Keuren Catalog and Handbook No. 36 containing valuable technical and engineering information on measuring problems and methods. Address:

VK

37th YEAR

THE *Van Keuren* CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

Optical Flats . . . Light Wave Equipment . . . Light Wave Micrometers . . . Gage Blocks . . . Wire Type, Taperlock and Trilock Plug Gages . . . Master Setting Disks . . . Thread Measuring Wires . . . Gear Measuring Wires . . . Carbide Plug Gages . . . Laps and Surface Plates . . . Precision Lapping Service.

for full operating efficiency

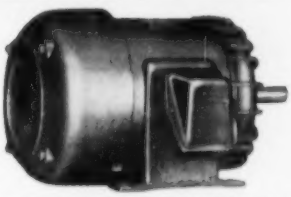
choose a Century MOTOR

***Performance-Rated* to Bring Out All the Top Performance That's Engineered Into Your Equipment**

DRIP PROOF—1/20 to 3/4 H.P.
A.C., Single or Polyphase
Send for Bulletin 1-5P1

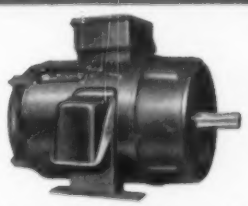
RIGID BASE, OPEN TYPE, PROTECTED
1 to 400 H.P.—A.C., Single or Polyphase
May be used in place of splash proof... screens available for rodent protection.
Send for Bulletin 6-1P1

CUSHION BASE, OPEN TYPE, PROTECTED—1/20 to 5 H.P.
A.C., Single or Polyphase
Send for Bulletin 6-1P1

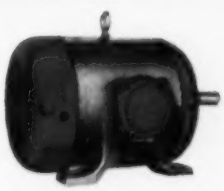


TOTALLY ENCLOSED FAN COOLED
1 to 100 H.P., A.C., Single or Polyphase
Send for Bulletin 6-1P1

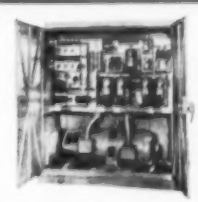
FLANGE BRACKET (NEMA "D")
Round, short frame—for horizontal or vertical operation
Send for Bulletin 6-1P1



FACE TYPE BRACKET (NEMA "C")
With feet for motor-mounted equipment
Send for Bulletin 6-1P1



EXPLOSION PROOF MOTORS
2 to 100 H.P.
UL approval Class I, "C" and "D"
Class II, "E," "F" and "G"
Send for Bulletin 6-1P45

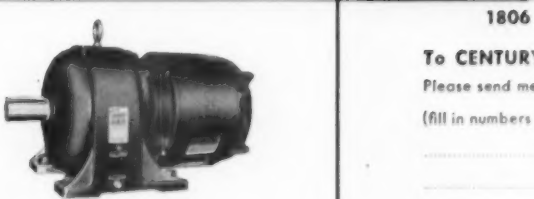


SELECTIVE SPEED DRIVES
1 to 150 H.P.
Offering a Wide Range of Closely Controlled Speeds
Send for Bulletin 11-1P1

Century Performance-Rating means that you can select precisely the right motor size, speed, frame, mounting and torque characteristics to fit the needs of each installation.

***Performance-Rated*©**
MOTORS
⅛ to 400 H. P.

Mail this coupon for FREE bulletins



CENTURY ELECTRIC COMPANY

1806 Pine St., St. Louis 3, Mo. • *Offices and Stock Points in Principal Cities*

GEAR MOTORS—1 to 125 H.P. (parallel)
⅛ to 3 H.P. (right angle or parallel)
A.C. or D.C., Speed to fit your need
Send for Bulletin 4-1P31

To CENTURY ELECTRIC COMPANY, 1806 Pine Street, St. Louis 3, Mo.
Please send me the following bulletins:
(fill in numbers here) .....

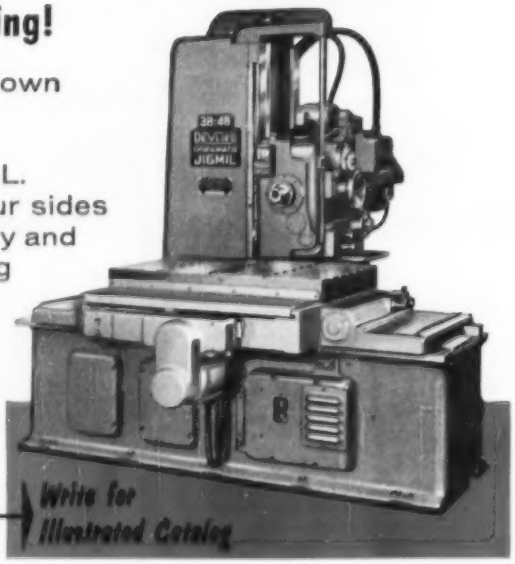
Name ..... *Title* .....
Company .....
Address .....
City ..... *Zone* ..... *State* CE-37

DIFFICULT JOBS ARE *routine on* DEVLIEG *SPIRAMATIC* JIGMILS®

PHOTO COURTESY OF DANROY BORING CO.

DeVlieg *SPIRAMATIC* JIGMILS® permit accurate machining of workpiece from 4 sides at 1 setting!

The above photograph, taken in a well known Detroit Tool Shop, illustrates a Special Hydraulic Fixture being machined on a DeVlieg Model 3B-48 *SPIRAMATIC* JIGMIL. This job was completely machined on four sides at one setting to precise limits of accuracy and operations included drilling, boring, milling and O.D. turning 22″ diameter trunnion.



Come to Detroit...

See a practical demonstration of the JIGMIL Technique

DE·VLIEG MACHINE COMPANY

450 Fair Avenue, Ferndale • Detroit 20, Michigan

Write for Illustrated Catalog

NEW! Revolutionary AIRengineering Development by Ingersoll-Rand..

TORSION BAR Torque control IMPACTOOLS

MULTIPLE TORQUE SETTINGS
2 TORSION BARS AVAILABLE:

- **No. L735. Max. torque 60 ft. lbs.**
- **No. H735. Max. torque 90 ft. lbs.**

Now you can have precision torque control with all the nut running power and speed of the world famous I-R IMPACTOOL!
TORQUE CONTROL

Size 5040T*

***For torques up to 550 ft. lbs., a Size 5340T *Torque Control* Impactool is available**

...how can YOU use these ADVANTAGES ON NUT RUNNING JOBS *where prescribed torques must be met?*

- **POSITIVE TORQUE CONTROL**—a revolutionary use of a rugged steel torsion bar for precision control of torque—combined with the power and speed of the Impactool.
- **SIMPLE TORQUE SETTING**—torsion bar adjusting sleeve is clearly calibrated for changing torque with easy-to-use torque jig.
- **TORQUE SETTING REMAINS CONSTANT**—for any nut running condition until the adjustment is changed.
- **ELIMINATES "OVER-TORQUE"**—impact mechanism rebounds instantly when preset torque is reached, tripping a foolproof rubber faced shutoff valve.
- **LOW MAINTENANCE**—combines many of the proven features of Ingersoll-Rand Impactools, with their enviable record of dependable performance and low maintenance.
- **REVERSIBLE**—full power in either direction.
- **NO CLUTCH**—to wear, slip or require adjustments.

Torque can be quickly and easily set, using the jig as shown above. The torsion bar automatically shuts off the tool when the nut running resistance becomes equal to the stress in the preset torsion bar.

Ask your Ingersoll-Rand AIRengineer for a demonstration now . . . or write direct for more information on this amazing development.

Ingersoll-Rand
Impactool Division
11 Broadway, New York 4, N.Y.

8-305

production begins with

Columbus Die-Tool

It takes the right machinery to build your product right! Columbus Die-Tool individually designs and builds tools, dies, and special machinery to produce your product alone. This gives you the advantages of lower operating cost, greater production and a higher quality product.

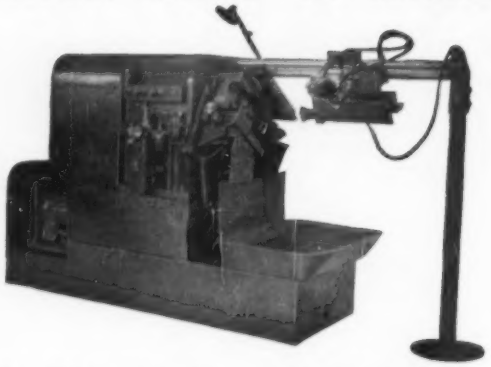
Let Columbus Die-Tool's more than 50 years of designing and engineering experience go to work for you. Contact CDT today about your special die, tool and machinery requirements.

Columbus Die-Tool
AND MACHINE COMPANY

P. O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1904

Manufacturers of
JIGS • FIXTURES • BUILDING MACHINE TOOLS COMPLETE
SPECIAL TOOLS • UNITS FOR MACHINE TOOLS

MODERN CUTTING - OFF MACHINE



Cuts off longer pieces than regular automatic machines—*any length you want.* FAST cutting and chamfering of tubing, pipe, shafting. Check the following figures:

½" Tubing	¼" Cold Rolled	1" Tubing
Cuts and Chamfers both outside edges of ¼" .035 wall tubing, 6" lengths, every 2.5 seconds.	Cuts and Chamfers both ends, 20" long, at rate of 1 every 20 seconds.	Cuts and Chamfers both outside edges, pieces 3" long. One every 3 seconds.

These popular, time saving machines are now available in four sizes, handling work up to 6¾" O.D. Their many cost cutting features are described and illustrated in our latest catalog that will be mailed promptly on request.

WRITE FOR ILLUSTRATED CATALOG

MODERN MACHINE TOOL CO.
2005 LOSEY ST. JACKSON, MICHIGAN

it's the SHAPE that counts!

ALL NEW... Speed-D-Burretts*
Controlled Size and Shape
ABRASIVE MEDIA for PRECISION BARREL FINISHING

Outlasts other media as much as 10 to 1 Controlled grain size Aluminum Oxide bonded firmly with specially formulated synthetic rubber to allow finishing of precision parts hitherto impossible to barrel finish. Molded and cured to controlled hardness that assures long life, maximum cushioning yet gives desired cutting, honing or polishing action. May be used with any equipment.

New "Burretts" permit abrasive action in the most remote corners and recesses of delicate, precision parts. Will not chip or splinter into odd shapes that lodge in blind or threaded holes. Prevents broken chip damage to expensive parts.

Write for catalog of prices, sizes, shapes and grits—today!

*Pat. Pend.

SPEED-D-BURR CORPORATION — PRECISION BARREL FINISHING
THE WORLD'S MOST COMPLETE LINE OF PRECISION BARREL FINISHING EQUIPMENT & SUPPLIES

Write for catalogs on:
FUTURAMA LINE • MITY-MITE LINE • SPACE MISER
MEDIA AND COMPOUNDS • HANDLING EQUIPMENT
Service is our most important product. Use it?

SPEED-D-BURR CORPORATION
3613 San Fernando Road, Glendale 4, Calif.

"They got Faster honing ...with 1/3 less stone pressure!"

A large manufacturer recently had a problem in engine cylinder honing after boring. Excessive time was required to bring the cylinder to the final dimension, and stone wear was high. The two honing oils being used seemed at fault.

R. J. Hughes, Sinclair Industrial Representative reports: "We made a routine call on their purchasing department at the time this situation was under study. They asked us for our solution. Based on previous experience with problems of this type, we recommended Sinclair HONOL® Light. The company agreed to test it."

DIAL READING REDUCED FROM 4½ TO 3!

"Test results were conclusive," continues Mr. Hughes. "On the same work, Sinclair HONOL Light substantially increased tool efficiency over the two competitive oils. Back pressure on the stone was reduced from a dial reading of 4½ to 3 ... a 33⅓% reduction ... *while accomplishing the same rate of removal!* Naturally, this company decided to convert all of their honing machines over to HONOL Light," concludes Mr. Hughes.

If you have precision honing machines it will pay to get the facts on Sinclair HONOL Oils. Contact your local Sinclair Representative, or write to Sinclair Refining Company, Technical Service Division, 600 Fifth Ave., New York 20, N.Y. *There's no obligation.*

SINCLAIR

CUTTING OILS and COOLANTS

When this man Lowers your cost*... it's NO ACCIDENT...he's a Safety Director

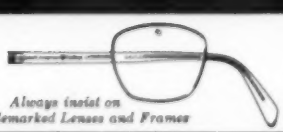
He Prevents Accidents Like This:
At a metal working plant, eye injuries represented 27% of the total first aid cases . . . 14% of all lost-time accidents and 29% of the company's compensation costs over a 6-year period. Due to the effort of the Safety Director the plant installed a 100% eye protection program which has since cut first aid eye cases to 14.9% of all first aid cases . . . lost-time eye cases to 2.8% of all lost-time cases . . . and eye injury compensation to 5% of all compensation costs. What's more . . . the plant estimates that at least three eyes were saved and more than $15,000 in compensation from "injuries that were prevented"!

A safety director administering a sound eye protection program is an unbeatable combination for reducing costs. The program alone can pay for itself in less than six months — and the safety director's services can be priceless when you figure what he can save on ALL types of industrial injuries. Ask an AO® Safety Representative to show you how little an eye protection program costs.

One of AO's new F5100 Series metal Safety glasses with "Ultrascopic Vision". Write for illustrated brochure.

American Optical

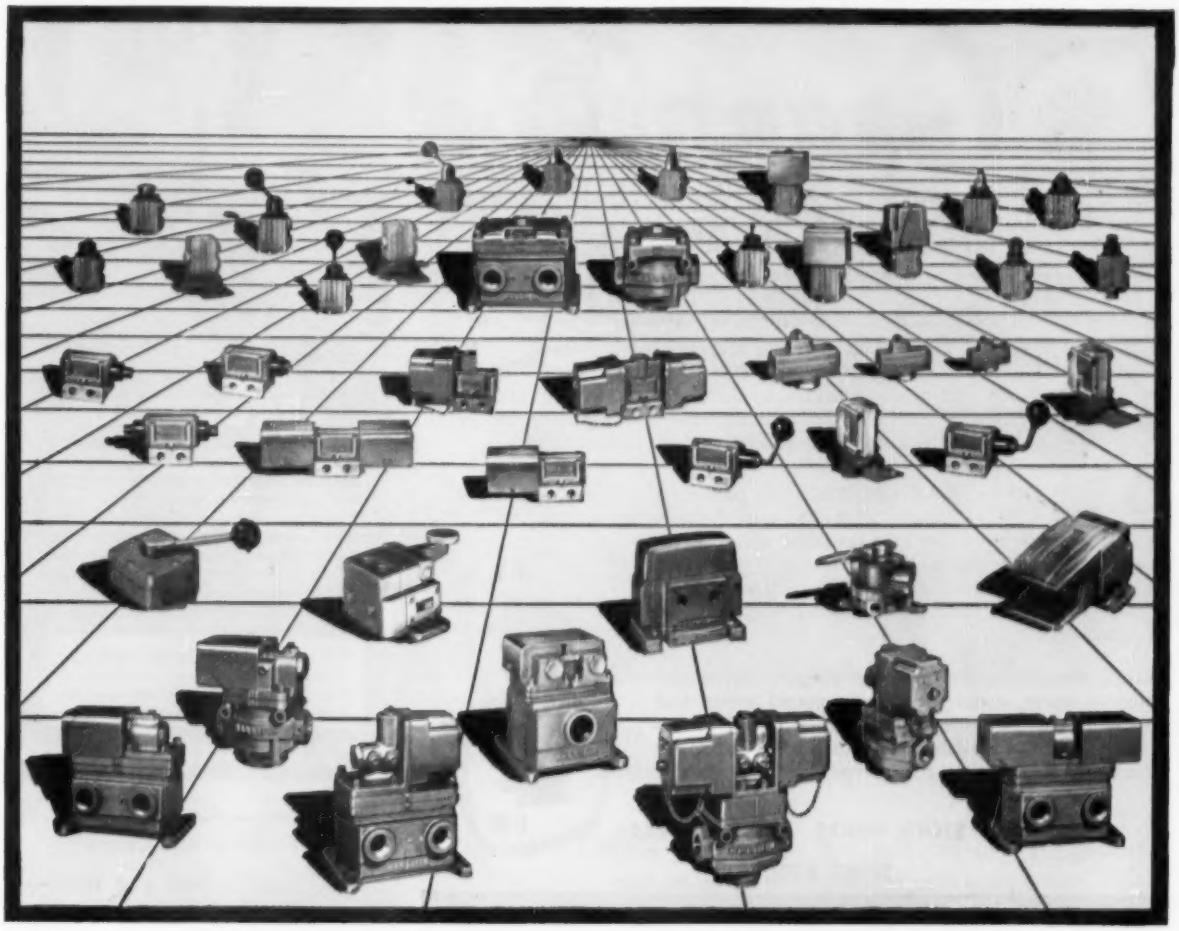
SAFETY PRODUCTS DIVISION



Always insist on AO Trademarked Lenses and Frames

SOUTHBRIDGE, MASSACHUSETTS
BRANCHES IN PRINCIPAL CITIES

FOR AIR CYLINDER CONTROL... Manual or Electric



Hannifin is your best valve source

What air control valves do you need, or prefer? Hannifin has all types—for your production lines or the machines you manufacture. They include:

P-M Pilot-Master Valves, solenoid controlled by integral pilot heads (including new-type, dust-tight, splashproof heads that completely meet J.I.C. recommendations). ⅜" to 1¼". 2-way, 3-way and 4-way.

P-M Master Valves. ¼" to 1¼". 2-way, 3-way and 4-way, air operated. For remote control from a wide choice of P-M Pilot Valves.

P-M Direct-Operated Valves. For direct control of small air cylinders. 2-way, 3-way and 4-way. ¼" and ⅛".

Disc Valves. Rotary and sliding reciprocating disc types for hand, foot or electric operation. ⅛" to ¼".

Micrometric Speed Control Valves for micrometer-like speed adjustment through control of exhaust flow.

You can simplify your air control problems by standardizing on Hannifin.

Stock Delivery On All Types

HANNIFIN

MAIL THE COUPON FOR PROMPT ACTION

- ☐ Have Field Engineer call at once
- ☐ Have Field Engineer stop by soon
- ☐ For the present, just send complete Hannifin Control Valves Catalog

Hannifin Corporation, 517 S. Wolf Rd., Des Plaines, Illinois

Name.....*Title*.....

Company.....

Address.....

City.....*Zone*.....*State*.....

Grant Speed Reducers

YOUR ASSURANCE OF BETTER PERFORMANCE

The *real* criterion for reduction units is unfailing performance over the years, with minimum maintenance. Our files show many cases where Grant Reducers are still providing every-day service, after two decades, without a breakdown.

What's back of such performance? Extra-quality features built into each Reducer, by gear experts . . . totally enclosed cast iron housings, radial thrust ball bearings, precision high-test bronze gears and worms of chrome vanadium steel. These features mean money in your pocket through trouble-free operation.

Grant manufactures a complete range of types and sizes — worm, double worm, compound worm and spur, helical and mitre gear — with reductions up to 3660-1 — most available from stock. Write for the latest catalog, describing each type in detail.

STOCK GEARS SPECIAL GEARS

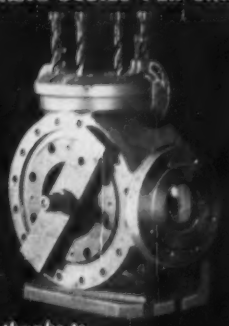
SPEED REDUCERS

GRANT GEAR WORKS INC.

Founded in 1877 by George B. Grant, the Pioneer Gear Man

169 WEST SECOND STREET BOSTON 27, MASS.

DRILLS 7% MORE GRAY IRON VALVE BODIES PER SHIFT



...thanks to

FERROCARBO®

Users everywhere report similar experiences. In fact, on 67 machining tests in 11 large machine shops, castings of gray iron treated with FERROCARBO averaged *89.5%* greater machinability per tool than untreated castings. These premium castings are finer-grained, denser, stronger, yet they COST YOU NO MORE... because your foundryman, using FERROCARBO, makes worthwhile savings in raw material costs.

FOR FREE BOOKLET on FERROCARBO, citing actual case histories of faster machining, with longer tool life, write The Carborundum Company, Dept. 11, Niagara Falls, N.Y. 54-81

CARBORUNDUM®

The modern metalworking fact you want— when you want it!

Great news for all concerned with metalworking! Now you can have a famous reference in entirely modernized form. THE NEW AMERICAN MACHINIST'S HANDBOOK brings you today's practice—today's needed data—in profusion.

The NEW AMERICAN MACHINIST'S HANDBOOK

Edited by RUPERT LE GRAND Senior Assoc. Ed., AMERICAN MACHINIST Based on AMERICAN MACHINISTS' HANDBOOK by Colvin & Stanley

BIGGEST IMPROVEMENT IN NEARLY 50 YEARS!
80% rewritten
Fully up to date
1579 pages
774 illustrations
45 big sections
$17.00
EASY TERMS
FREE TRIAL!

Answers hundreds of machine shop and drafting room questions — layouts, feeds, speeds, tools, jigs, fixtures, materials, standards, tolerances, forming and finishing, and many others. Means time and money saved—better results.

McGRAW-HILL BOOK CO., Dept. FA-1-2
327 W. 41 St., N. Y. 36, N. Y.

Send me Le Grand's THE NEW AMERICAN MACHINIST'S HANDBOOK for 10 days' examination on approval. If satisfactory I will send (check one) ☐ $3 in 10 days and $2 a month until $11 is paid, or ☐ full purchase price of book. (We pay delivery cost if remittance accompanies this coupon. Same examination and return privilege.)

(Print)
Name
Address
City Zone State
Company
Position

For price and terms outside U.S., write McGraw-Hill Int'l., N.Y.C. FA-1-2-56

BUZZER

* Reg. U. S. Pat. Off.

INDUSTRIAL *GAS* EQUIPMENT

NO BLOWER OR OTHER POWER NEEDED

JUST CONNECT TO GAS SUPPLY

BUZZER Equipment, a buy-word since 1911, provides the hottest and quickest heating . . . without blower or power. Wide range of turn down and heat control. You can depend on a BUZZER.

Send for complete BUZZER Catalog

Oven Furnaces

Mfrs. since 1911

CHARLES A. HONES, Inc.

126 SO. GRAND AVE., BALDWIN, L. I., N. Y.

BURNERS · FURNACES (Heat Treating, Melting, Soldering)

the TORK-LOK DESIGN . . .

A New Approach to COLLET CHUCKING

PAT. APPLIED FOR

STYLE 1

STYLE 2

STYLE 3

TORK-LOK DESIGN . . . Inclined flats in both collet sleeve and arbor shaft.

GREATER ACCURACY . . . Because flat surfaces are in constant contact on both expansion and contraction.

TORQUE TRANSMISSION . . . Greatly increased by self energizing feature of precision mated flats.

LESS COLLET BREAKAGE . . . Built-in safety stops control both expansion and contraction.

GEOMETRICALLY SEALED . . . Metal-to-metal contact excludes foreign matter thus reducing wear.

SELF-RELEASING . . . Preload feature assures easy part removal.

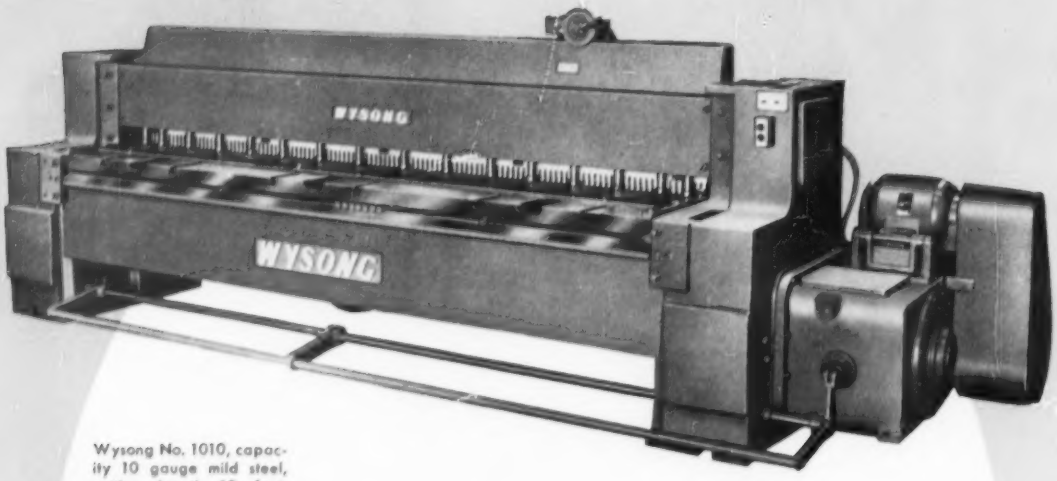
CONCENTRICITY . . . Locates straight or tapered holes on true center.

WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD • DETROIT 20, MICHIGAN

PRECISION GAGES • CONE-LOK JIGS • DIAPHRAGM CHUCKS AND ARBORS • PRECISION PARTS

PRECISION INVESTMENT CASTINGS • PRECISION HEAT TREATING OF AIRCRAFT PARTS



Wysong No. 1010, capacity 10 gauge mild steel, cutting length 10 feet.

Greater Accuracy! Greater Production! Less Maintenance Costs!

Hi-tensile casting construction gives the necessary weight and mass to Wysong squaring shears. With a tensile strength of 35,000 to 40,000 P.S.I. hi-tensile casting construction can resist the shock and pounding a shear must take. The heavily ribbed table, knife-bar and end frames resist sag or deflection and *maintain accurate alignment*. Because hi-tensile castings absorb vibrations, Wysong shears run quieter and smoother.

Standard features of Wysong shears include:

- Automatic, compensating holddown. Each foot under individual tension. Compensates for varying thicknesses in metal and permits simultaneous shearing of different thicknesses.
- Ball bearing precision back gauge. Adjusts to .0078 (1/128th) inches.
- Time proven, trouble free, 9-jaw clutch with built in non-repeat unit.
- Straddle mounted gears, run in oil.
- Metal finger guard, mounted on holddown. Does not obstruct view of cutting line.

Wysong shears can be equipped with power operated back gauge, a light gauge, remote control switch, automatic lubrication, extension gauges, and rubber pads for holddown feet. Rake of top blade can be changed for cutting plastics, composition sheets and special metals.

Wysong also builds air power and foot operated squaring shears and bending rolls. See your dealer or write to factory for full information.

Buy a Wysong... It's miles ahead.

WYSONG

Wysong and Miles Company
Greensboro, N. C.

SIMONDS ABRASIVE CO.

You'll find it HERE!

. . . just about every kind of grinding wheel you can think of . . . from the smallest mounted wheel to the largest roll grinding wheel. Simonds makes them all—all top quality and engineered for your jobs!

Get the Simonds Data Book and Stock List with Consumer Net Prices—and you're set to get the grinding wheels you need, quickly!

CALL YOUR SIMONDS DISTRIBUTOR

LOCAL STOCK
FAST SERVICE

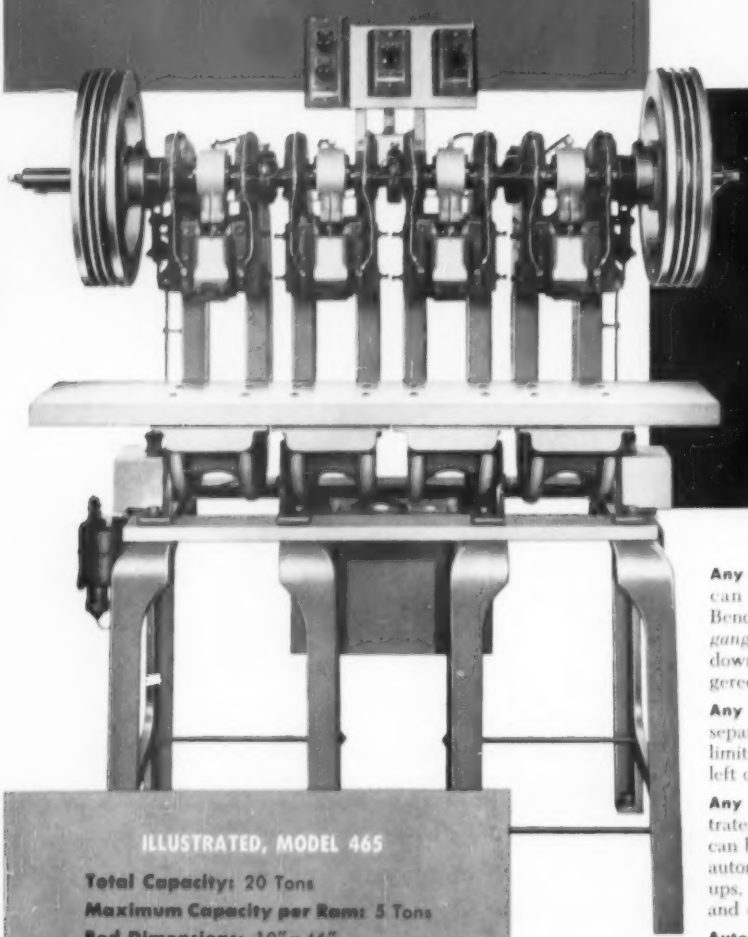
SIMONDS ABRASIVE COMPANY • PHILADELPHIA 37, PA.

Branch Warehouses: Boston, Detroit, Chicago, Portland, San Francisco. Distributors in Principal Cities

Division of Simonds Saw and Steel Co., Fitchburg, Mass.

HOW TO LICK
BIG PRESS JOBS
WITH
LOW COST EQUIPMENT!
and make capital savings up to 50% or more!

Do you have jobs requiring the bed area of large presses but necessitating only limited tonnage? Then this Benchmaster MULTIPLE RAM Press fills your exact requirements. Designed especially to win back a highly competitive market for one customer by cutting costs and increasing production, *it does a number of jobs better than any existing equipment!*



- Provides unusually large bed area.
- Greatly reduces press investment.
- Facilitates progressive die operations.
- Enables use of separate tooling at each progressive stage.
- Reduces tooling maintenance and expense.
- Permits substitution of duplicate dies at individual stations with little loss of press time.
- Increases production 200 to 300% over large presses.

ILLUSTRATED, MODEL 465

Total Capacity: 20 Tons
Maximum Capacity per Ram: 5 Tons
Bed Dimensions: 10" x 46"
Stroke Length: 4½"

Other models supplied to your specifications with choice of 2, 5 or 8 ton rams.

Any number of rams—Any number of presses can be ganged using 2 ton, 5 ton or 8 ton Benchmasters, *providing all members of the gang are of equal tonnage.* Rams can operate down simultaneously, alternately or in staggered sequence.

Any center distances—Ram distances can be separated to any requirements beyond frame limitations. Each individual ram is adjustable left or right for final line-up on individual dies.

Any type automatic controls—The unit illustrated is equipped with electric clutches; rams can be single tripped for setting up or all rams automatically operated for continuous-run setups. An emergency stop button halts motors and disengages all clutches simultaneously.

Automatic lubrication—All moving parts are interconnected to a common pressurized container for simultaneous, 1 shot lubrication.

1835 W. Rosecrans Avenue, Gardena, California

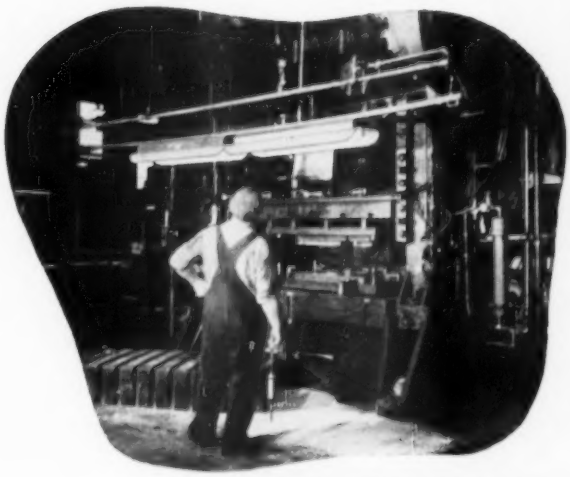
benchmaster

World's largest manufacturer of small punch presses and mills.

SAVINGS START

when you stop "hand feeding" hungry bearings...and change lubrication methods from

Backward to Forward!



ALEMITE PORTABLE POWER GUN

saves 23.9 man-hours for every 100 pounds of lubricant

...saves right down the line!

• A 400-pound barrel of lubricant—any type—arrives at plant oil room. It's sealed, fresh, "refinery-clean."

• An Alemite Power Transfer Pump is inserted in drum. Lubricant stays sealed against dirt, grit, contamination.

• In just 60 seconds a portable power gun is filled with lubricant that is still as fresh as when it left the refinery. No mess—no waste!

• Alemite Portable Power Gun is ready to roll anywhere in the plant . . . to service hundreds of bearings with clean, safe lubricant!

Are you lubricating hundreds of bearings with ordinary hand gun equipment that's best suited to service only a *couple of dozen bearings*?

An ordinary hand gun can be emptied in a few minutes. But an Alemite Power Gun gives positive, fast, safe lubrication to hundreds of bearings *without a single re-fill!* This difference means a saving of 23.9 *man-hours* on every 100 pounds of lubricant used. Because lubricants are always kept "refinery-fresh," machines get better protection, have less breakdowns. You make important *savings in machine-hours* . . . increase production, cut maintenance costs!

An Alemite Portable Power Gun eliminates wasteful spillage . . . makes housekeeping easier, less expensive . . . reduces product spoilage. Air or electrically operated models for all types of lubricants. There's a type and size pump for *your* plant. Mail coupon at right for the full story about Alemite savings!

FREE! New Booklet:
"5 Plans for Better Lubrication"
Alemite, Dept. C-46, 1850 Diversey Parkway
Chicago 14, Illinois

Please send me my FREE copy of "5 Plans for Better Lubrication."

Name _____

Company _____

Address _____

City _____ State _____

ALEMITE

REG. U. S. PAT. OFF.

A PRODUCT OF SW STEWART-WARNER

Ask anyone in industry

A Product of STEWART-WARNER CORPORATION

Applying Simple, Known Designs—Resulting in Space and Cost Savings

Six-Station Rotary Indexing Machine

PART—Retainer—Transmission Rear Bearing

Station 1—Load Fixture.
Station 2—Drill (4) tap holes on 15° angle.
Station 3—Chamfer (4) tap holes on 15° angle.
Station 4—Drill (2) tap holes straight in.
Station 5—Chamfer (2) tap holes straight in.
Station 6—Tap (6) holes *dual* angle tapping head.

MACHINE FEATURES

- Hydraulic Rotary Index Table. 33" to table top.
- A dual angle tapping head eliminates the cost of an additional station.
- Crescent Style QM-9 self-contained hydraulic quill-type power units for drilling.
- Production—180 pieces per hour gross.

The above Six-Station Rotary Indexing Machine is a standard machine comprised of standard components throughout, arranged to suit the customer's requirements.

Write for Bulletin No. 54

Phone: (Detroit) DUnkirk 2-5300

CRESCENT TOOL & MACHINE CO., INC.

1780 Southfield Road **Lincoln Park, Michigan**

ALL in ONE TOOLHEAD*

BORING
FACING
TURNING
GROOVING
UNDER CUTTING

SIX SIZES AVAILABLE

ALL HAVE POWER FEED FOR FACING

Model "D"

*A BORING HEAD THAT WON'T FACE IS NOT COMPLETE

WRITE for COMPLETE DETAILS

CHANDLER TOOL CO
Muncie, Indiana

COMBINED BORING & FACING TOOL HEADS
Chandler-Duplex

M&M NEW HYDRAULIC KEYSEATER

In this new M & M Keyseater hydraulic action produces exceptionally smooth performance. Cutter stroke and feed are automatically controlled, tool relief is also automatic. High degree of accuracy is assured. Available in a wide range of sizes. Rugged construction features insuring long life are based on 67 years experience. Mechanical drive keyseaters available for cutting keyways in all sizes up to 5" wide and 60" long. Write for specification folder.

90-R

MITTS & MERRILL

104 Holden Street • SAGINAW, MICHIGAN

STANDARDIZED

UNIVERSAL INDEX PLUNGERS

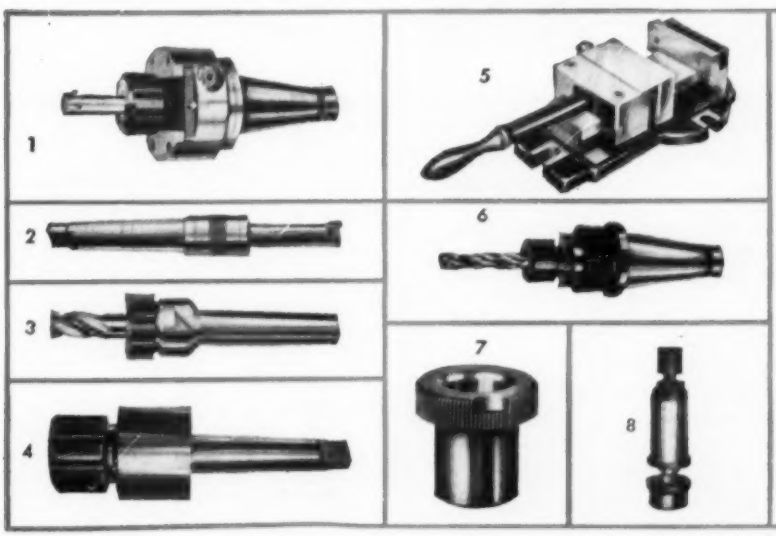
SAVE TIME
SAVE MONEY

Universal's Straight and Taper Plungers made in standard sizes save the time and expense of designing and machining special index plungers for multi-station tools. They come to you complete, ready for installation at approximately ¼ the cost of specially made plungers.

Soft pin knob permits connection to actuating lever or air cylinders by several different methods. Locating bushing, plunger and plunger bushing are hardened and ground.

Plunger is easily assembled from either top or bottom. And it can be removed in either direction by removal of hex nut.

Universal Plungers greatly simplify jig or fixture manufacture because plunger body and bushing have same diameter so that all holes can be bored with same tool, often in same setting.



UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 1
MICHIGAN

(1) BORING CHUCK
(2) MIKRO-LOK BORING BAR
(3) STANDARD COLLET CHUCK
(4) FLOATING COLLET CHUCK
(5) WEDGE-LOCK PRODUCTION VISE
(6) "KWIK-SWITCH" TOOL HOLDER
(7) STANDARD DRILL BUSHING
(8) UNIVERSAL INDEX PLUNGER

168

Versatile!

THE NO. 21 Oliver DRILL POINTER

- CAPACITY—3/32" TO 1/2", SPECIAL COLLET PERMITS GRINDING DOWN TO #57.
- INCLUDED ANGLES OF 80° TO 180° ARE READILY OBTAINABLE.
- CLEARANCES—SETTING GAGE PROVIDES ANY OF FOUR DIFFERENT CLEARANCES FOR CORRECT DRILLING.
- BUILT-IN DIAMOND WHEEL DRESSER.
- AVAILABLE IN BENCH TYPE OR PEDESTAL MODELS.

*Modified #21 drill pointer available for adding notch points to heavy web drills.

Oliver #510 (¼" to 3" capacity) drill pointers and Oliver point thinning machines are also supplied.

Write for brochure or send drills for sample sharpening.

Oliver INSTRUMENT • COMPANY

1414 EAST MAUMEE OLIVER OF ADRIAN ADRIAN, MICHIGAN

FACE MILL GRINDERS • AUTOMATIC DRILL GRINDERS • DIE MAKING MACHINES
TOOL & CUTTER GRINDERS • DRILL POINT THINNERS • TEMPLATE TOOL GRINDERS

UNIT MACHINING COST CUT 17% ON THIS GRAY IRON CASTING

...thanks to

FERROCARBO®

Users everywhere report similar experiences. In fact, on 67 machining tests in 11 large machine shops, castings of gray iron treated with FERROCARBO averaged 89.5% greater machinability per tool than untreated castings. These premium castings are finer-grained, denser, stronger, yet they COST YOU NO MORE... because your foundryman, using FERROCARBO, makes worthwhile savings in raw material costs.

FOR FREE BOOKLET on FERROCARBO, citing actual case histories of faster machining, with longer tool life, write The Carborundum Company, Dept. 12, Niagara Falls, N.Y. 66-60

CARBORUNDUM®

A copy of this quick-reading, 8-page booklet is yours for the asking. It contains many facts on the benefits derived from your business paper and tips on how to read more profitably. Write for the "WHY and HOW booklet."

• • • • • • • • • • • • •

McGraw-Hill Publishing Company, Room 2710, 330 West 42nd St., New York 36, N. Y.

Handle your small part precision JIG BORING on the LINLEY JIG BORER

Why tie up your big, costly jig borers on small work when you can get maximum utility at less cost per hour on a machine exactly fitted to your work. Put your small work on the LINLEY where it belongs and reserve your large machines for large work, *where large work belongs*. You'll save money this way.

SPECIFICATIONS

Table Movement: 6" x 10" — Table Size: 7" x 17½"

Complete details sent promptly on request

LINLEY BROTHERS CO.

664 STATE ST. EXT., BRIDGEPORT 1, CONN.

"Red Tang"
AMERICAN PATTERN
FILES and RASPS
For general or special purpose machine shop filing; saw sharpening; and for use on wood, leather and soft metals.
SIMONDS
NOW...
SIMONDS
has a Complete Line
of "Red Tang" Files!
Simonds now offers you all types of files in the Right Length, the Right Shape and the Right Cut for every filing job. What's more, Simonds Files are Grade A. First Quality only . . . backed by Simonds reputation for outstanding quality, dependability and service.
American-Swiss
SWISS PATTERN
FILES
For precision work where the craftsman's delicate touch is a matter of pride and profit.
SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS
Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon
Canadian Factory in Montreal, Que.
Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.
Heller Tool Co., Newcomerstown, Ohio
Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada
For Fast Service
from
Complete Stocks
Call your
SIMONDS
Industrial Supply
DISTRIBUTOR
VIXEN
Milled Curved-Tooth
FILES
For fast, smooth work on lead, babbit, zinc, aluminum, bronze, plastics, cast iron and steels — everywhere.
ROTARY FILES
For power driven filing in tool and die shops, pattern shops, aircraft and automotive plants, machine shops, foundries.

HE KEEPS THEM ROLLING—
THE MAN FROM ATLANTIC

The Atlantic specialist in industrial lubrication is a highly skilled expert. He's spent years in the study of every heavy lubricating and cutting-oil problem . . . and he's backed by other Atlantic specialists in lubrication research, production, quality control and marketing.

Atlantic's experience since 1870 has made us familiar with *your* lubricating needs. We've developed the products necessary to do any lubrication job perfectly . . . at the lowest cost . . . for every wheel that turns in industry.

Your company can benefit from our extensive experience and services. For further information on Atlantic's family of products for industrial lubrication and metal processing, write or wire Dept. R4, The Atlantic Refining Company, at the nearest office listed below.

ATLANTIC

LUBRICANTS · WAXES
PROCESS PRODUCTS

PHILADELPHIA, PA.
260 South Broad St.

PROVIDENCE, R. I.
430 Hospital Trust Bldg.

CHARLOTTE, N. C.
1112 South Boulevard

SYRACUSE, N. Y.
Salina and Genesee Sts.

READING, PA.
First and Penn Aves.

PITTSBURGH, PA.
Chamber of Commerce Bldg.

Atlantic Refining Company of Brazil
Edificio Castello
151 Avenida Nilo Pecanha
Rio de Janeiro, Brazil

Porto Rico Oil Company, Inc.
Box 4832, San Juan, Puerto Rico

A SHORT CUT TO A FINISHED PRODUCT

SAVE YOURSELF TIME AND TOOL CHARGES

with Anaconda multiple-plunger press products—in a wide choice of metals

If you need parts like these in quantity, The American Brass Company can save you time and money. Through its specialized experience—and thousands of stock tools—it may save tool charges, too.

Ferrules, grommets, eyelets, deep-drawn cups and shells, and thousands of other intricate, close-tolerance parts made from strip metal are everyday business. American Brass Company design engineers and toolmakers have earned an enviable reputation for cutting costs and performing the almost impossible in design and production.

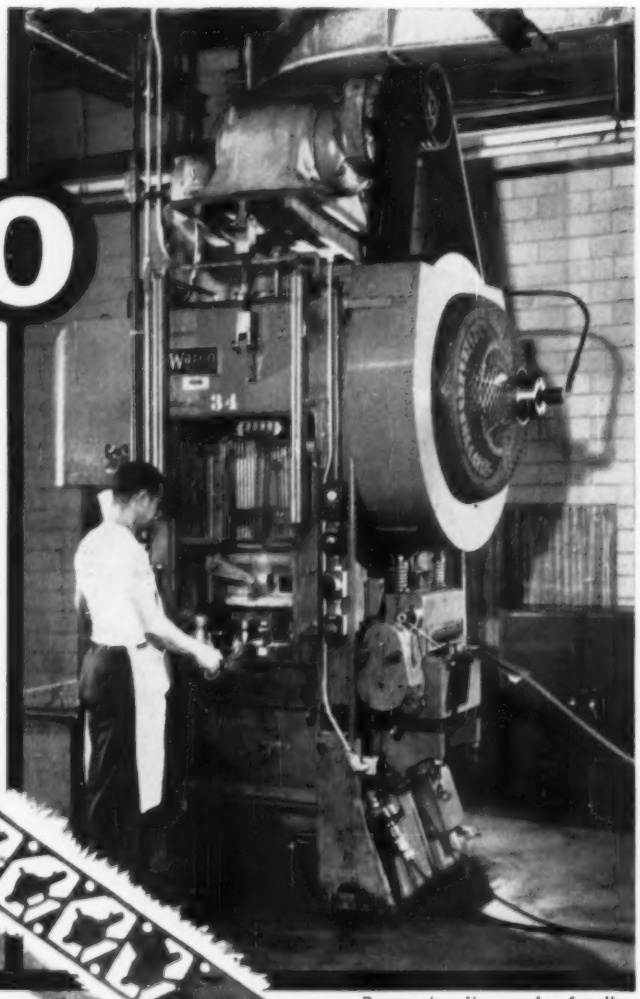
Your choice of metal: Such fabricated products can be furnished in copper, brass, bronze, nickel silver, nickel, iron, steel, stainless steel, and aluminum – in a wide variety of finishes.

Standard products: For a selection of more than 1000 eyelets of common sizes and styles, as well as eyelets kept in stock for immediate shipment, write for Catalog BG-1.

Special products: Just send a sample, drawing, or description, together with the quantity you need, the metal to be used, and other pertinent information. Address: The American Brass Company, Waterbury Brass Goods Division, Waterbury 20, Conn.

ANACONDA®
MULTIPLE-PLUNGER PRESS PRODUCTS

How Warco® PRESSES help Kodak make precision cameras



Progressive die sample of pull-down claws for Kodak's Cine-Kodak Medallion 8 Camera. Warco Press produces about 6,000 per hour.

For the past eight years, Eastman Kodak Company has been using Warco Presses to stamp out many of the components used in their popular camera line. From time to time, as production demanded, Kodak has added to its Warco equipment and has found it met specifications right down the line. The 75-ton High Speed press, above, is typical of the Warco equipment. Feeding directly from coil stock through progressive dies they blank, perforate, form and emboss. The press operates at speeds up to 100 strokes per minute, turning out as many as 6,000 completed pieces every hour.

You'll find more and more Warco Presses operating in plants, like Eastman Kodak where quality and long, trouble-free service are appreciated. *The Federal Machine and Welder Co., Warren, Ohio.*

Cine-Kodak Medallion 8

Brownie Holiday Flash

Brownie Hawkeye

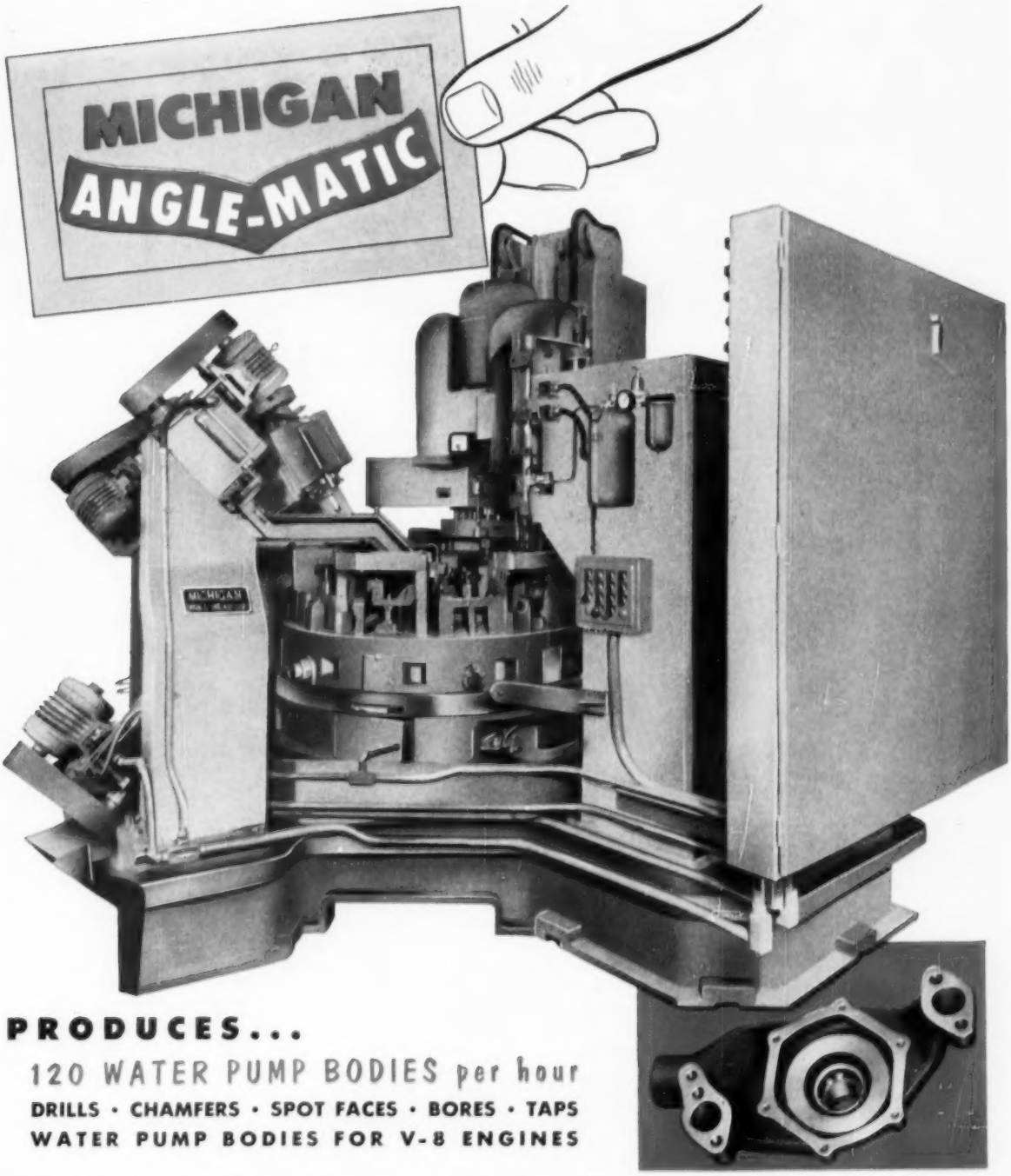
9872

Federal® WELDERS

Warco® PRESSES

The Federal Machine and Welder Company

WARREN, OHIO



PRODUCES...

120 WATER PUMP BODIES per hour

DRILLS • CHAMFERS • SPOT FACES • BORES • TAPS

WATER PUMP BODIES FOR V-8 ENGINES

For Faster, More Economical Production

Michigan

We also invite your inquiries as to our line of tapping units, and index tables, both manual and automatic.

DRILL HEAD CO. Detroit 34, Michigan

engineers and manufacturers of production machines and drilling equipment

Cut your costs with *Curtis*

AIR COMPRESSORS
AIR HOISTS
AIR CYLINDERS

A plentiful supply

of air to speed production throughout your plant is assured with powerful, precision-built *Curtis* Air Compressors.

- **air-cooled, two stage—¼ to 20 H.P. inclusive**
- **water-cooled, single stage—20 to 50 H.P. inclusive**
- **Timken tapered main bearings permit easy external adjustment**
- **long-life pressure-lubricated connecting rod and piston pin bearings**

Tank-mounted compressors in sizes from ¼ through 15 H.P. inclusive (1 to 78 cu. ft.)—also available in base-mounted type.

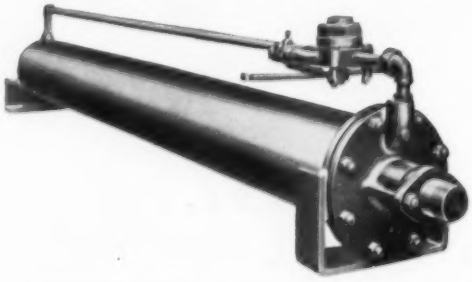
Simple and base-mounted compressors from ¼ through 50 H.P. inclusive (1 to 300 cu. ft.).

LIFT, LOWER, PUSH or PULL

easily, economically and safely with *Curtis* Air Hoists and Cylinders . . . capacities up to 10 tons.

- **lower initial cost**
- **lower maintenance costs**
- **smooth operation and precision control**
- **self-closing, rotary disc self-grinding valves**

PENDANT AIR HOISTS . . . ideal for any lifting or lowering operation.



BRACKETED AIR CYLINDERS . . . can be mounted horizontally or vertically for lifting, lowering, pushing or pulling.

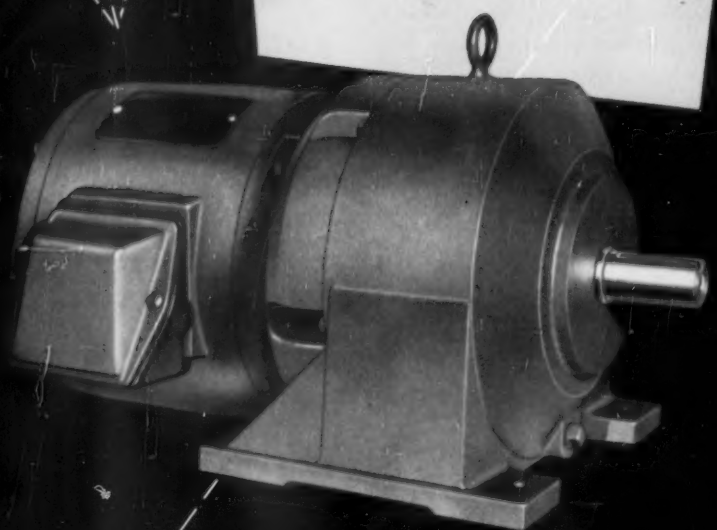
FOR COMPLETE INFORMATION ON THIS CURTIS COST-SAVING EQUIPMENT . . . WRITE TODAY!

CURTIS MANUFACTURING COMPANY
Pneumatic Division
1924 KIENLEN AVENUE • ST. LOUIS 20, MISSOURI

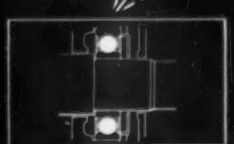
CM-337

OTHER CURTIS PRODUCTS: Automotive Lifts and High Pressure Car Washers; Commercial and Home Air Conditioning

Don't overlook what you can't see

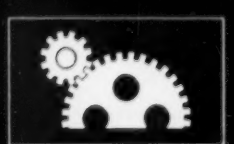


You can't always see what makes a gearmotor outstanding. It's the attention paid to small design details that makes the difference. Here are a few of the details that make the new Reliance Gearmotor stand above the rest.

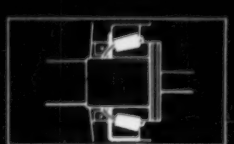


FOOLPROOF METERMATIC motor bearing lubrication and oil bath gear lubrication for long-life protection against wear.

INDUCTION HARDENING of the tough alloy steel gears gives a perfect combination of wear resistance and strength.



SIMPLIFIED GEARING with few moving parts reduces friction losses and lessens chances of breakdown.



THRUST BEARINGS handle heavy overhung loads safely by placing strain on the frame instead of the shafts.

Find out the complete story for yourself—contact your Reliance representative or write for Bulletin E-2408.

E-1509

REDUCE SPEED

RELIANCE ELECTRIC AND ENGINEERING CO.

CLEVELAND 10, OHIO • OFFICES IN PRINCIPAL CITIES

Canadian Division: Welland, Ontario

JOB WANTED

Experienced Assembly Engineer. Successful record of effecting substantial assembly savings in 7 out of 10 cases. Will check your fastening problems and make specific recommendations for reducing assembly costs. Trained to fit the right screw to the right job. Works best when product is in design stage. Can also replace slow, costly assembly techniques with the fast, effective P-K® method without disturbing production routine. For complete details, call your local Parker-Kalon distributor. No cost or obligation.

this specialist wants to work for you!

Call in a P-K Assembly Engineer and find out how you can profit through reduced assembly costs the P-K way. Take advantage of this unique Parker-Kalon service—another of the many reasons why users say—"if it's P-K . . . it's O. K."

PARKER-KALON DIVISION, GENERAL AMERICAN TRANSPORTATION CORPORATION—CLIFTON, NEW JERSEY

PARKER-KALON® *fasteners*

Sold Everywhere Through Leading Industrial Distributors. Warehouse in Chicago, Illinois

"...and then they put that hot bar of metal between the upper die and the lower die and.....WHAM!"

Look who's showing off! Well, he doesn't know everything—yet! But he sure has learned something about his old man's forging business from that color booklet in his back pocket.

It's called "Forgeland, U.S.A."—an interesting, instructive book about *your* business and *ours*, written in *his* language and with pictures, too! We've prepared it here at Erie, because we think it's nice for Pop to be a hero in his own home—and we're all for encouraging it.

To quote your beloved smart-aleck, "Aw c'mon Dad, get me the book will yuh, huh, please, huh, please—it's for FREE, anyhow . . . not even any box tops or hammerscale to send in!"

let your Youngsters learn about FORGING

If you have a raft of kids—send for a raft of books:

ERIE FOUNDRY CO., ERIE, PA.

Send.....“FORGELAND U.S.A.” Books to:

NAME_____

FIRM_____ TITLE_____

ADDRESS_____

CITY_____ STATE_____

ERIE

ERIE FOUNDRY CO. ERIE, PA.

"OUR 61st YEAR"

FORGING HAMMERS • TRIMMING PRESSES • HYDRAULIC PRESSES AND ALLIED EQUIPMENT

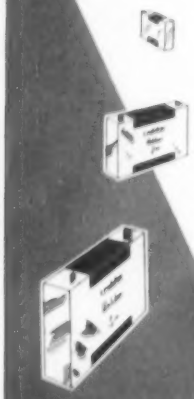
Worn Gage Blocks Cost You Money!

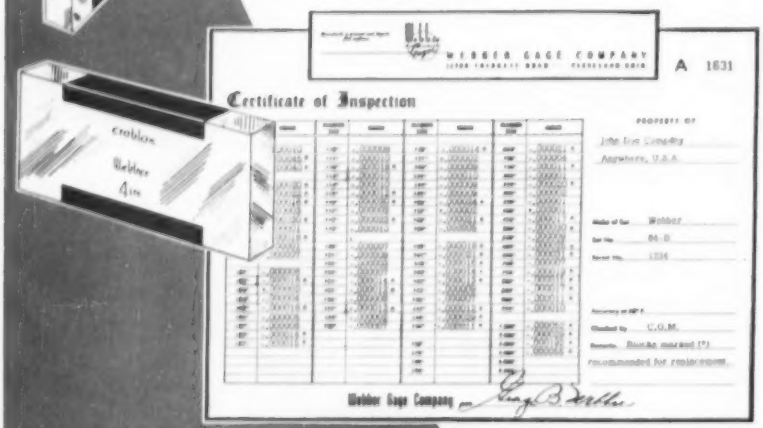
How do you *know* when your gage blocks are worn? By frequent rejects . . . assembly difficulties . . . reduced profits? Pretty expensive! Better play safe by using WEBBER's *periodic inspection service*.

This inspection service includes comparison of your blocks with master blocks certified by the U. S. Bureau of Standards; removal of burrs and nicks which impair accuracy; certification of the degree of wear of each block; and, if you wish, replacement of all blocks worn or damaged beyond repair, with Webber CROBLOX.

Thus, in your Webber-reconditioned set, the blocks which will receive the most use, and hence the most wear, are CROBLOX — solid chrome carbide, one of the hardest, longest-wearing materials known. CROBLOX will out-last by many years the best standard steel blocks!

Webber returns your gage blocks (any make) within 24 working hours after receipt. Inspection costs $18.00 for an 84-block set, less for smaller sets. **Send in your gage blocks *before* production difficulties occur!**

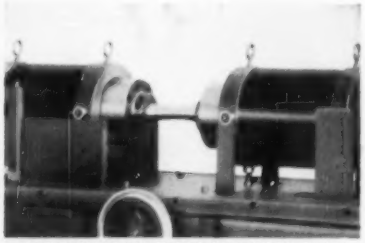




Webber
GAGE COMPANY

12901 Triskett Rd.
Cleveland 11, Ohio

LARGEST EXCLUSIVE MANUFACTURER OF PRECISION GAGE BLOCKS



MEEHANITE CASTINGS ARE MADE ONLY BY MEEHANITE FOUNDRIES

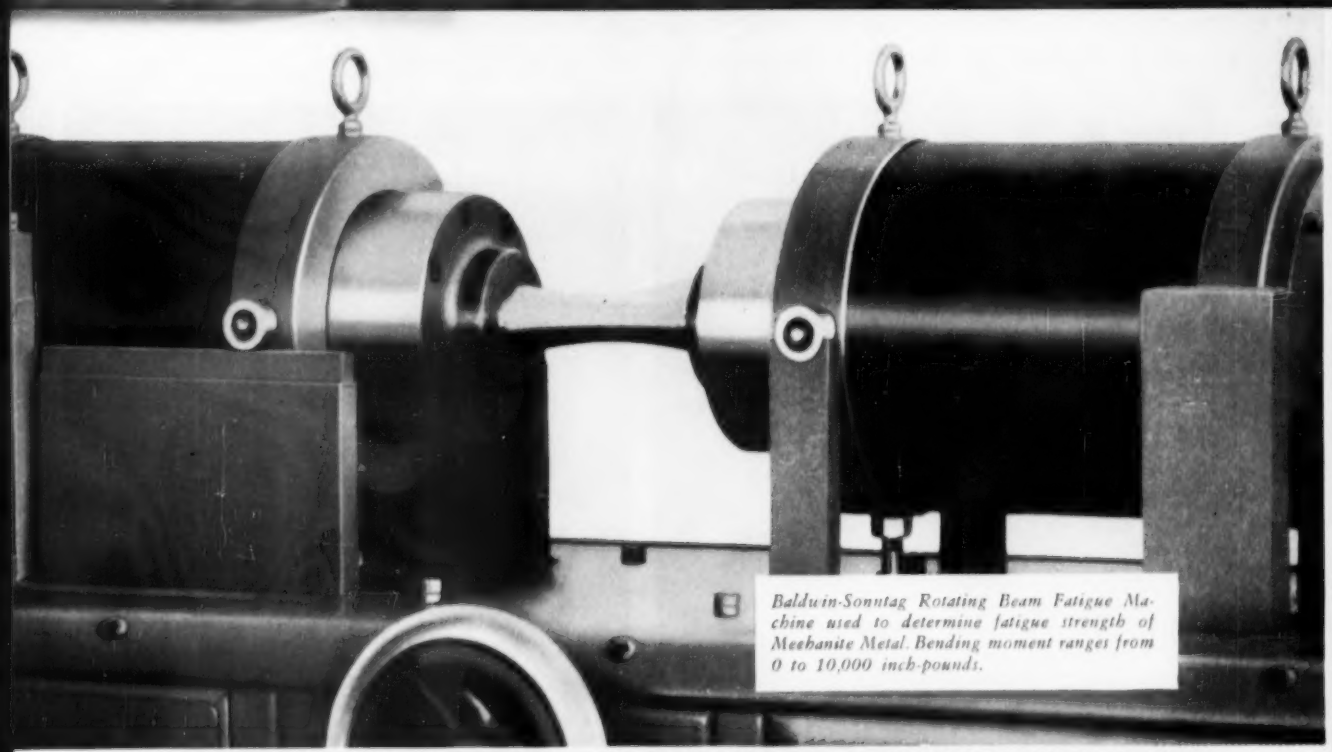
The American Laundry Machinery Co., Rochester, N. Y.
Atlas Foundry Co., Detroit, Mich.
Banner Iron Works, St. Louis, Mo.
Barnett Foundry & Machine Co., Irvington and Dover, N. J.
Blackmer Pump Co., Grand Rapids, Mich.
Compton Foundry, Compton, Calif.
Continental Gin Co., Birmingham, Ala.
The Cooper-Bessemer Corp., Mt. Vernon, Ohio and Grove City, Pa.
Crawford & Doherty Foundry Co., Portland, Ore.
DeLaval Steam Turbine Co., Trenton, N. J.
Empire Pattern & Foundry Co., Tulsa, Okla.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Florence Pipe Foundry & Machine Co., Florence, N. J.
Fulton Foundry & Machine Co., Inc., Cleveland, Ohio
General Foundry & Mfg. Co., Flint, Mich.
Georgia Iron Works, Augusta, Ga.
Greenlee Foundry Co., Chicago, Ill.
The Hamilton Foundry & Machine Co., Hamilton, Ohio
Hardinge Company, Inc., New York, N. Y.
Hardinge Manufacturing Co., York, Pa.
Johnstone Foundries, Inc., Grove City, Pa.
Kanawha Manufacturing Co., Charleston, W. Va.
Kennedy Van Saun Mfg. & Eng. Corp., Danville, Pa.
Koehring Co., Milwaukee, Wis.
Lincoln Foundry Corp., Los Angeles, Calif.
Palmyra Foundry Co., Inc., Palmyra, N. J.
The Henry Perkins Co., Bridgewater, Mass.
Pohlman Foundry Co., Inc., Buffalo, N. Y.
Rosedale Foundry & Machine Co., Pittsburgh, Pa.
Ross-Meehan Foundries, Chattanooga, Tenn.
Shenango-Penn Mold Co., Dover, Ohio
Sonith Industries, Inc., Indianapolis, Ind.
Standard Foundry Co., Worcester, Mass.
The Stearns-Roger Mfg. Co., Denver, Colo.
Valley Iron Works, Inc., St. Paul, Minn.
Vulcan Foundry Co., Oakland, Calif.
Dorr-Oliver-Long, Ltd., Orillia, Ontario
Hartley Foundry Div., London Concrete Machinery Co., Ltd., Brantford, Ontario
Otis Elevator Co., Ltd., Hamilton, Ontario

SEND FOR THESE BULLETINS TODAY

- **"PROOF THAT MEEHANITE BRIDGES THE GAP" BULLETIN NO. 37**
- **"CAMS, CAMSHAFTS AND CRANKSHAFTS" BULLETIN NO. 39**

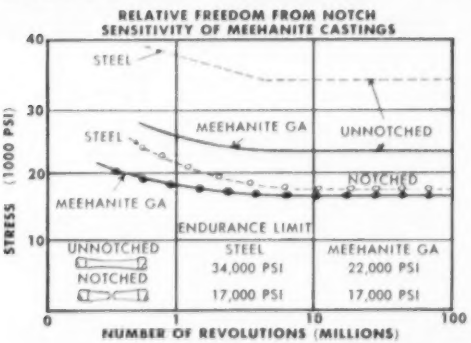
Write today to Meehanite Metal Corporation, Dept. 4D, 714 North Avenue, New Rochelle, N. Y.

MEEHANITE®



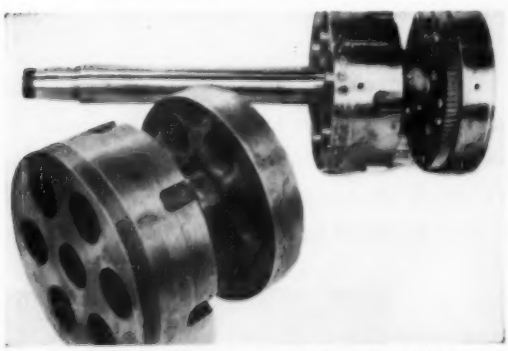
Baldwin-Sonntag Rotating Beam Fatigue Machine used to determine fatigue strength of Meehanite Metal. Bending moment ranges from 0 to 10,000 inch-pounds.

MEEHANITE CASTINGS SHOW HIGH RESISTANCE TO FATIGUE UNDER ROTARY BENDING STRESSES

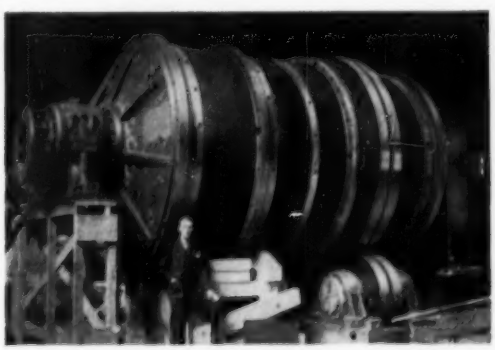


Meehanite Metal, subjected to alternating bending stresses, exhibits high endurance values and the fatigue strength is higher in relation to tensile strength than most other materials. The endurance limit approximates 45% of the tensile strength, thus providing a larger margin of safety against mechanical failure in the presence of stress raisers, such as notches, keyways, poor fillets and poor machine finish.

Consequently, Meehanite Metal has found wide application in the manufacture of crankshafts, centrifuges, ball mill crushers, machine tool spindles and other parts repeatedly stressed by bending loads. *Write today for Bulletin No. 37, "Proof that Meehanite Bridges the Gap," and Bulletin No. 39 "Cams, Camshafts and Crankshafts."*



Meehanite spindles for automatic bar and chucking machines withstand rapid and heavy torque shocks and maintain accuracy of tool alignment during service.



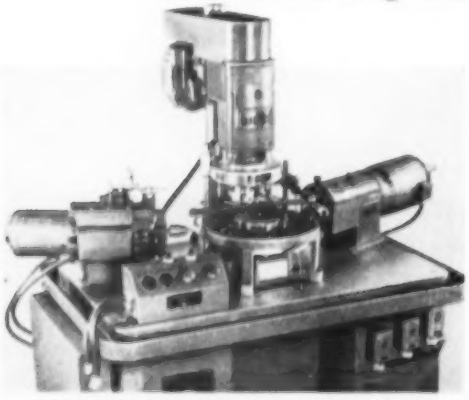
Marcy Mill carries ball load of 50 tons with 70-ton load on each trunnion requiring maximum fatigue life. Meehanite Metal has been proven superior to steel.

MEEHANITE METAL®

MEEHANITE METAL CORPORATION • NEW ROCHELLE • NEW YORK

THE A.D.U. DRILLING UNIT
Self-contained air-driven unit with sensitive electric control for single and multiple drilling

NEW ETTCO'S Tapping and Drilling Twins ... the versatile combination that solves your small hole problems



A high-production, special purpose combination drilling-tapping machine built entirely from standard Ettco units and components.

NOW—two separate self-contained, built-for-the-purpose units that meet most single or multiple drilling and tapping requirements.

Both units have been designed for extra power, speed and rigidity to insure greater precision at high production rates.

Ettco's Tapping and Drilling Twins are available as individual units or as standard upright machines. They can also be built into automatic drilling and tapping machines simply by mounting them in any desired combination on a standard base. ***Write for details — today.***

"See your Authorized Ettco Distributor"

ETTCO TOOL CO., Inc.
590 Johnson Ave. Brooklyn 37, N. Y.
Chicago • Detroit • Los Angeles • Indianapolis

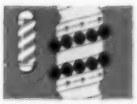
Ettco-Emrick **the right equipment for every small hole drilling and tapping need.**

HOW MANY POSITIONING PROBLEMS CAN THESE AMAZING UNITS SOLVE FOR YOU?

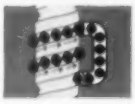
Frankly, we don't know. Almost daily we hear of some new application that never occurred to us. But we do know this: electronics engineers are achieving the "impossible" with Saginaw ball/bearing Screws and Splines, particularly these miniature sizes, from 1½ to 3 inches long.

CHECK THESE UNPRECEDENTED PERFORMANCE ADVANTAGES:

Saginaw ball/bearing SCREWS



Nut *glides* on steel balls. Like stripes on a barber pole, the balls travel toward end of nut through spiral "tunnel" formed by concave threads in both screw and mating nut.



At end of trip, one or more tubular guides lead balls diagonally back across outside of nut to starting point, forming closed circuit through which balls recirculate.

UP TO 5 TIMES MORE EFFICIENT

Up to 95% efficiency guaranteed in transforming rotary to linear motion; over 80% efficiency, linear to rotary. Require less than 1/5 as much torque as conventional Acme screws for equal output.

SAVE SPACE, WEIGHT, POWER

Permit much smaller, lighter motors and auxiliary equipment. Saginaw b/b Screws have been built from 1½ inches to 39½ feet in length.

PRECISE POSITIONING AND SYNCHRONIZING

Machine-ground types provide precision control within fractional thousandths of an inch, plus perfect synchronization of two or more movements.

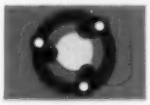
OPERATE IN VERY ADVERSE ENVIRONMENTS

Saginaw b/b Screws have been designed and built to operate from −75° to +900° F. Even if lubrication fails or cannot be originally provided, they will still function with remarkable efficiency.

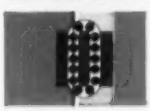
LONG, DEPENDABLE SERVICE LIFE

Accurately predictable life engineered to design requirements. Special Gothic arch groove design and multiple circuits assure dependable performance.

Saginaw ball/bearing SPLINES



The *Saginaw b/b Spline* radically increases the efficiency of transmitting or restraining high torque loads. Instead of *sliding* against each other, the mating surfaces *glide* on rolling balls.



The steel balls recirculate in closed circuits formed by mating longitudinal raceways spaced around the circumference of both inner and outer splines. Guides return balls to starting point.

40 TIMES LOWER FRICTION COEFFICIENT THAN ORDINARY SLIDING SPLINES

By applying the same basic gliding ball principle pioneered by Saginaw in the ball/bearing screw, this revolutionary new kind of spline makes practical new engineering designs never before possible.

TRANSMIT OR RESTRAIN HIGH TORQUE LOADS FAR MORE EFFICIENTLY

In any application where column length must change under torque load, the Saginaw b/b Spline offers unprecedented freedom from sliding spline restrictions.

WIDE CHOICE OF ATTACHMENTS

Can be fitted with integral gears, clutch dogs, bearing and sprocket seats or other attachments for use with electric, hydraulic or pneumatic units.

WIDE RANGE OF SIZES AND TYPES

Saginaw b/b Splines have been designed from 3 inches to 9 feet in length, and from ⅝ to 3¾ inches in diameter. To convert push-pull to rotary motion, helical types are available with very high leads, ranging from 20:1 to 100:1.

Saginaw

ball bearing Screws & Splines

MAIL COUPON TODAY FOR NEW ENGINEERING DATA BOOK

Saginaw Steering Gear Division
Ball Bearing Screw & Spline Operation
General Motors Corporation
Dept. 4R, Saginaw, Michigan

Please send your Engineering Data Book to:

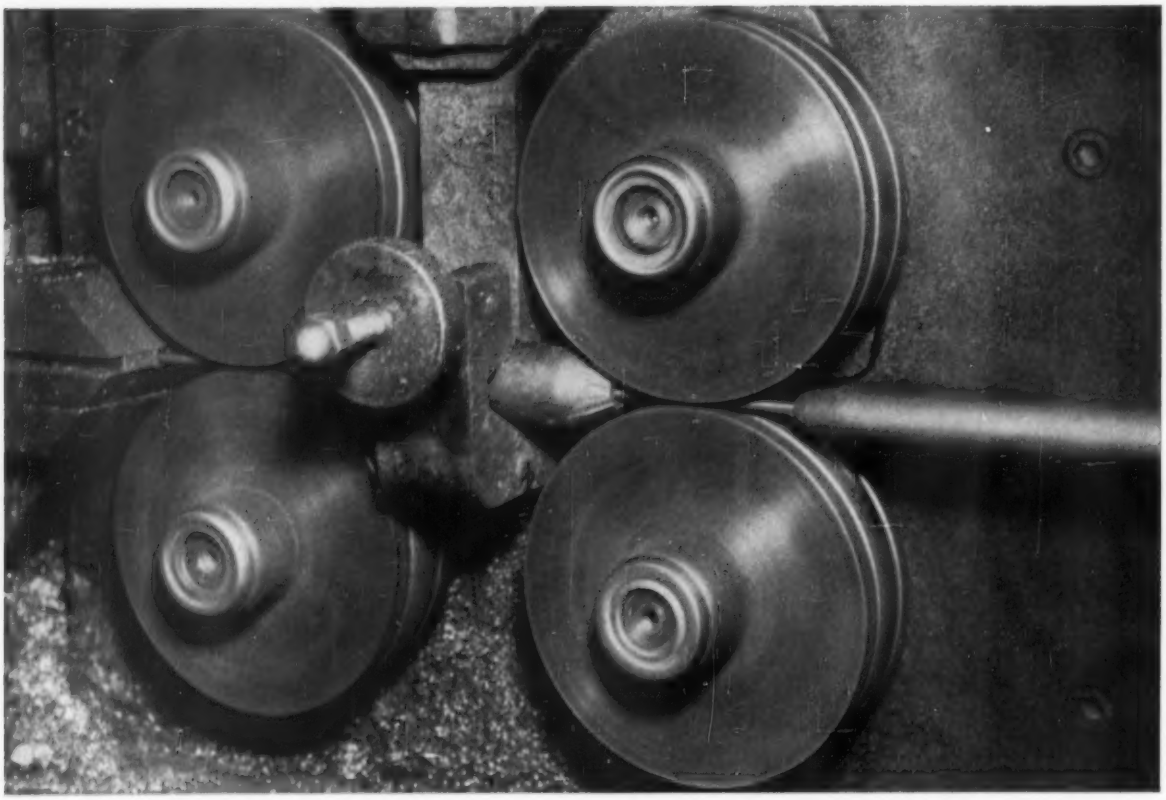
Name—Title _____

Firm _____

Address _____

City _____ Zone _____ State _____

76 MILLION welding rods through these **CROMOVAN** feed rolls!



36 months service and still going strong!

CROMOVAN, a Firth Sterling air hardening, high carbon–high chrome die steel is a terrific performer in wear and abrasion resistance applications.

For example, carbon steel feed rolls at Marquette Manufacturing Company, Minneapolis, lasted only seven months even when serviced constantly, but CROMOVAN replacements are still going strong after 36 months of grueling use and *no* servicing! Four feed rolls guide 14″ welding rods (stainless, carbon, and alloy steel) into a flux coating machine at 700 ft. per minute and 76,000,000 rods passed through them with only .022″ groove wear and *no down time* for redressing.

You, too, can realize comparable savings, reduced maintenance, and higher production when you adopt CROMOVAN for feed rolls, guides and wear parts. Write for Technical Bulletin 20-010 or 20-011 (Free Machining), today.

Mr. Tooley says–

"Firth Sterling offers the advantage of a single source of supply for both tungsten carbides and high grade tool and die steels for every shop tooling purpose. Because we have both you get *unbiased* recommendations."

R-316

Firth Sterling

—INC—

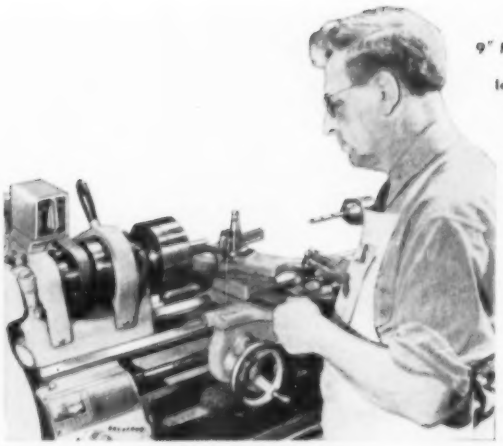
GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

MILLS: McKEESPORT, TRAFFORD, DETROIT, HOUSTON

OFFICES AND WAREHOUSES*: BIRMINGHAM CHICAGO* CLEVELAND DAYTON DETROIT* HARTFORD* HOUSTON LOS ANGELES* NEW YORK PHILADELPHIA PITTSBURGH WASHINGTON WESTFIELD, N.J.

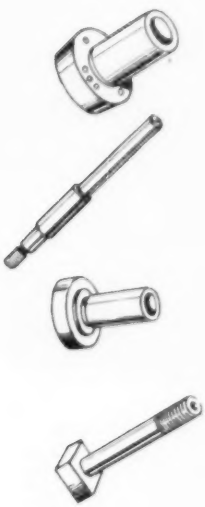
PRODUCTS OF FIRTH STERLING METALLURGY

High Speed Steels
Tool & Die Steels
Stainless Specialties
High Temperature Alloys
Sintered Tungsten Carbides
Firth Heavy Metal
Chromium Carbides
High Temperature Cermets
Zirconium

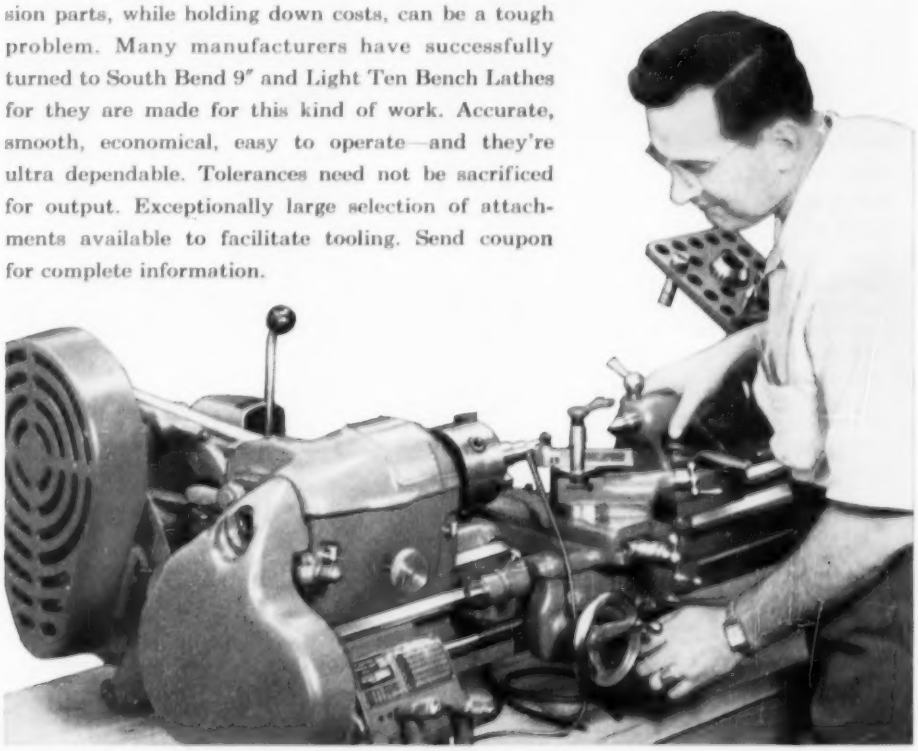


9" Model A Bench Lathe—
base price $396
less electrical equipment

BETTER PRECISION PARTS AT LOWER COSTS



Keeping up the required production of small precision parts, while holding down costs, can be a tough problem. Many manufacturers have successfully turned to South Bend 9" and Light Ten Bench Lathes for they are made for this kind of work. Accurate, smooth, economical, easy to operate—and they're ultra dependable. Tolerances need not be sacrificed for output. Exceptionally large selection of attachments available to facilitate tooling. Send coupon for complete information.



Light Ten Toolroom Bench Lathe—base price $731 less electrical equipment

SOUTH BEND 1906 50th ANNIVERSARY 1956

SOUTH BEND Lathe, South Bend 22, Indiana

Send literature on _____ 9 Lathes, _____ Light Ten Lathes, _____ Engine and Toolroom Lathes, _____ Turret Lathes, _____ Milling Machines, _____ Shapers, _____ Drill Presses, _____ Pedestal Grinders.

Name _____

Company _____

Street _____ City and State _____

dixi 60

horizontal optical jig borer

with 5 optical microscopes

DESIGNED AND BUILT FOR:

VERSATILITY
Optical settings for operations in all planes and compound angles . . . Equally suitable for tooling, short-run or production work . . .

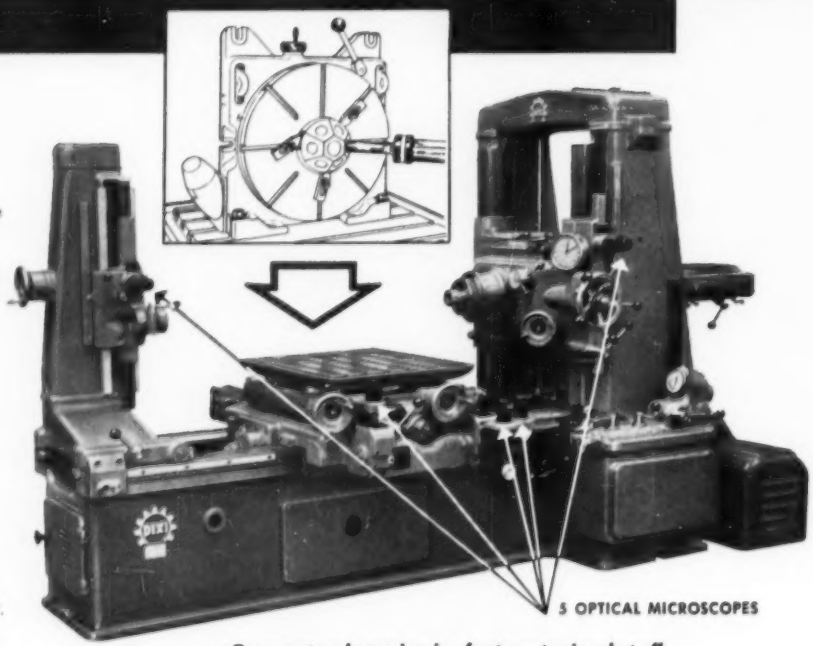
ACCURACY
Overall accuracy of .0002"

A precision machine for *JIGLESS* boring, facing, milling, and drilling work, in all planes. Built-in 360° optical rotary table, 28¾" x 32⅝". All spindle and table settings by optical microscopes. Infinitely variable hydraulic feeds. Mechanical spindle feeds with automatic depth stop. #40 taper spindle-speeds infinitely variable to 1400 R.P.M. Special features eliminate effect of spindle overhang on accuracy.

DIXI 450 PRECISION OPTICAL CIRCULAR DIVIDING TABLE

Direct readings of 1 sec.

(See insert picture above) rigidly mounted (not tilting) on built-in rotary table permits holding close tolerance relations between bores in all planes, including bores at compound angles. ALL IN ONE SET-UP. All sides of the work piece except the mounting face machined in one set-up.



- ***Guaranteed service by factory trained staff***
- ***Engineering staff available for consultation***
- ***Spare Parts in New York stock***
- ***Your operators trained***

DIXI 60 now in wide use in leading Aircraft and Manufacturing Plants throughout the United States.

Names available upon request.

SEE THIS VERSATILE MACHINE IN OPERATION

at our New York or Cleveland Show Rooms. Write for Complete descriptive literature and prices to Department 21. Catalogues on additional production equipment also available on request.

MBI

Our Headquarters in New York City

M.B.I.

export & import ltd.

A Division of Machinery Builders, Inc.

475 Grand Concourse, Bronx 51, N. Y.

"Over 20 years experience in designing & building machinery"

Phone: MOtt Haven 5-0900

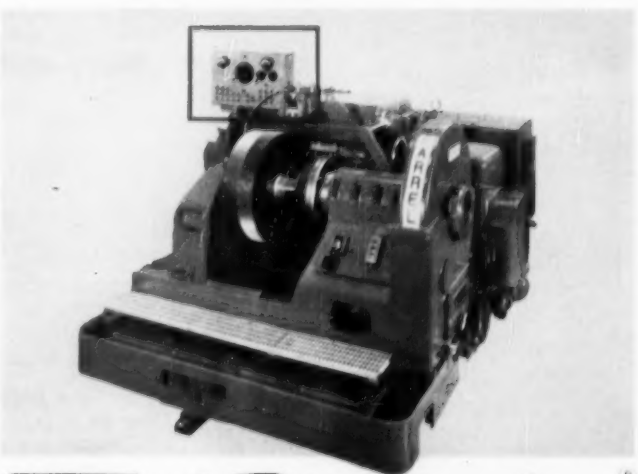
- RPM of main crank controlled by rheostat; indicated on meter. By pressing a button, RPM is converted to a direct reading in feet per minute of the slide.
- Meter indicates strokes per revolution of cutter, and is adjustable by flow-control valve. This enables operator to select any rate within machine's range.
- Work can be fed to cutters at any rate desired. Saddle is clamped and unclamped to main bedways by pushbutton control.
- Pilot lights protect against: (1) low pressure in lubrication system; (2) low pressure on the cutter head relief; (3) operating machine with cutter head clamp unlocked.

NOW... complete electrohydro control for all operations on the Farrel-Sykes "Twin-Head" gear machine

To provide the most precise and convenient operating control, the Farrel-Sykes "Twin-Head" gear generator is now equipped with an electrohydro control system. For all functions, the machine responds instantly to the touch of pushbuttons located on a single panel at the operator's station. Fullest advantage of the machine's extreme accuracy and high production speed is obtained.

Another outstanding advantage of the Farrel-Sykes machine is its versatility. It cuts every type of herringbone gear, single helical and spur gears, two members of a cluster gear at the same time, and other toothed and cylindrical forms.

Send for additional information.



Farrel-Birmingham

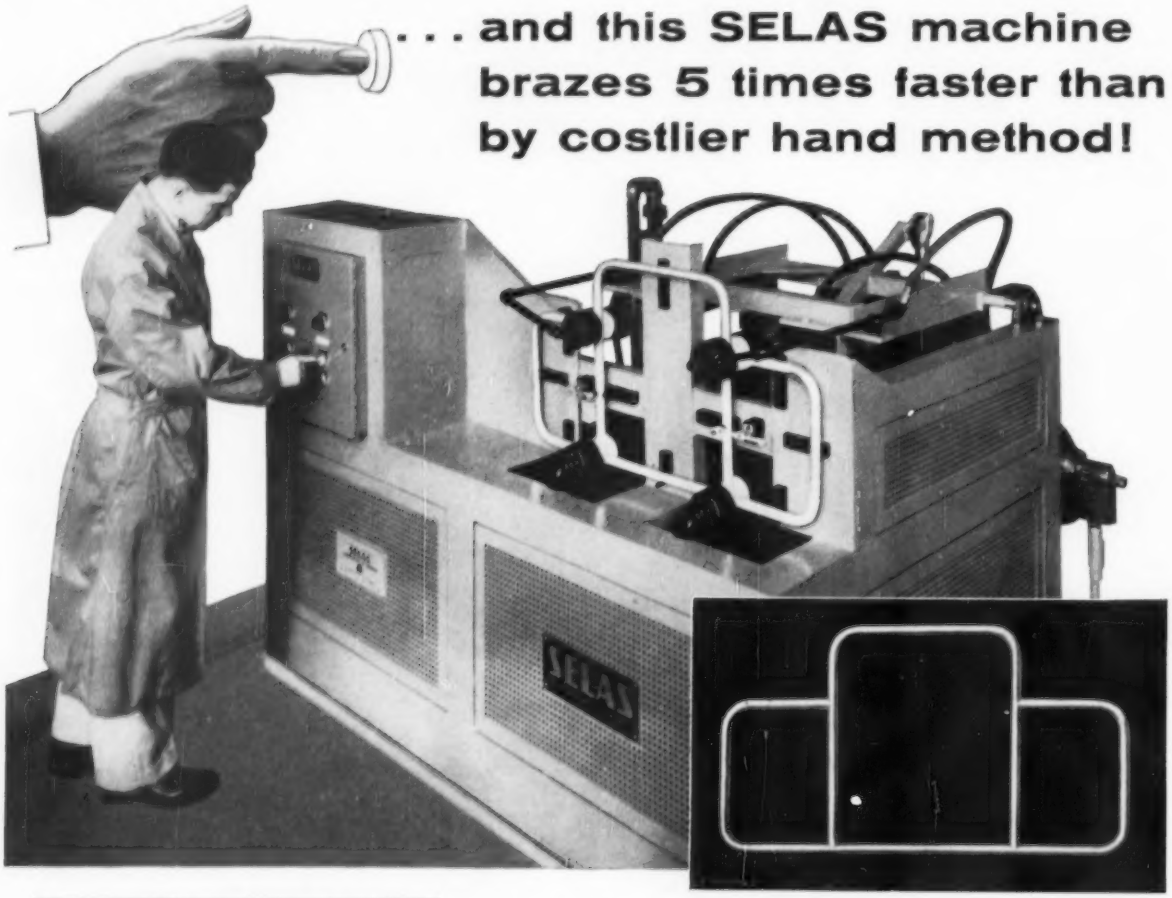
FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT

Plants: Ansonia and Derby, Conn., Buffalo and Rochester, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Akron, Chicago, Los Angeles, Houston

FB-1060

the *push-button* releases built-in skills

. . . and this SELAS machine brazes 5 times faster than by costlier hand method!



Just push the button, after placing the workpiece in the fixture of this Selas semi-automatic brazing machine. That's all the skill needed to aluminum-braze this hospital bedframe section.

In addition to SIMPLE LABOR SKILLS you can expect these other advantages with Selas brazing:

- √ SPEED
- √ REPRODUCIBLE UNIFORMITY
- √ LOWER UNIT COST
- √ CUSTOM-CONSTRUCTED YET VERSATILE
- √ WIDE VARIETY OF BASE AND FILLER METALS READILY HANDLED
- √ SINGLE RESPONSIBILITY: SELAS DESIGNS, CONSTRUCTS AND SERVICES YOUR MACHINE

The cycle consists of high fire, low fire, standby for cooling, and automatic retraction of burners . . . and 25 of these assemblies are joined each hour. Previous hand method produced 40 per day and the labor skill had to be high because of the narrow temperature margin between workpiece and filler metal.

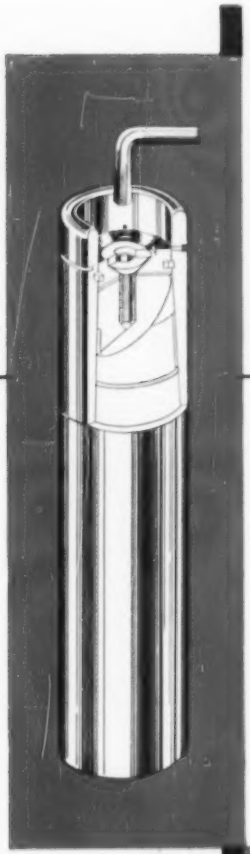
Aluminum-brazing of aluminum tubing is a severe test of brazing skill. Selas meets the test, day in, day out; assembly after assembly—because the skills are *built into* the machine.

Send for new bulletin No. 34—"Production Brazing and Soldering" and reprint "Mechanical Heating puts Brazing on the Production Line."

SELAS CORPORATION OF AMERICA DRESHER, PENNSYLVANIA

Heat and Fluid Processing Engineers

DEVELOPMENT • DESIGN • CONSTRUCTION



One Man Removes Large Punch Holder in 3 Minutes!

with SUPERIOR

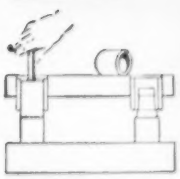
REMOVABLE CAP GUIDE PINS

End Troublesome Binding in Die Set Assembly

Superior's Removable Cap Guide Pins eliminate punch holder binding on guide posts when parting dies. The cap is removed from the pin merely by loosening a socket head screw which holds the cap in place. This frees the punch holder at the most critical point of the pin where it is apt to cock or bind. Instead of needing 2 or 3 die makers to remove the punch holder from a set, one man can easily do this work alone in a few minutes.

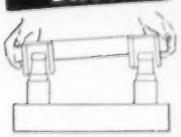
NOW OFFERED IN PIN DIAMETERS OF 1¼" UPWARD, AS STANDARD EQUIPMENT ON ALL SUPERIOR DIE SETS. SPECIFY IF DESIRED. WRITE FOR COMPLETE FREE INFORMATION.

FAST



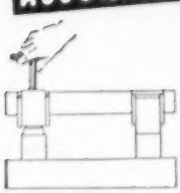
REMOVING CAP

SAFE

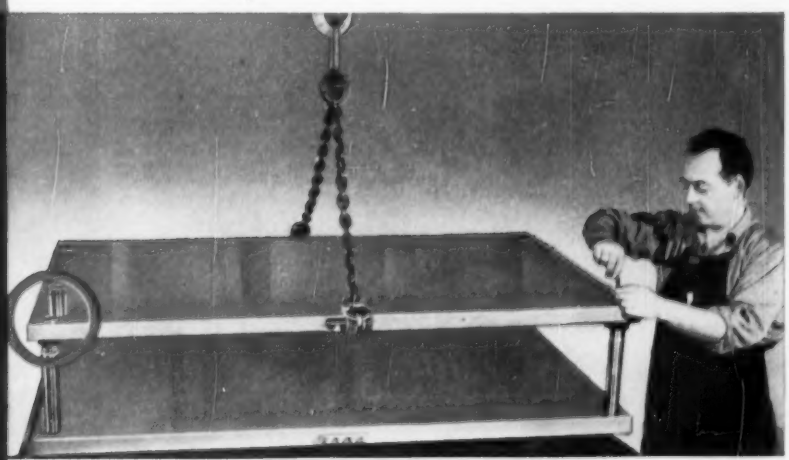


PARTING DIE SET

ACCURATE



REPLACING PUNCH HOLDER



For Fast Local Service Call These Expert Superior Representatives

Kalamazoo, Mich.—Phone 5-7988
Indianapolis, Ind.—BRoadway 5668
Chicago, Ill.—RAndolph 6-8871
Dallas, Tex.—Riverside 5138
Rockford, Ill.—Phone 3-3932
St. Louis, Mo.—JEfferson 5-1223
Milwaukee—Mitchell 5-6027
Orange, N. J.—ORange 5-5810
Dayton, Ohio—Hemlock 6209
Memphis, Tenn.—3-7727
Eau Claire, Wis.—2-3453
St. Paul, Minn.—PRior 6485
Winter Park, Fla.—4-0464
New Haven, Conn.—LO 2-1731
Brooklyn, N. Y.—NAvarre 8-6690
PLANTS AT
Milwaukee, Wisc.—Mitchell 5-6027
Plainville, Conn.—SHerwood 7-2761

SUPERIOR STEEL PRODUCTS CORP.
2754 S. 19th ST., MILWAUKEE, WIS

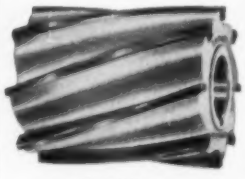
6 new ways to cut floor-to-floor time!

"Helicarb" milling cutters have a constant included cutting angle. The cutting load is uniformly distributed over the full length of the cutting edge. Cutters stay sharp longer, give far better dimensional control, better finishes, and greater stock removal. On many jobs, rough and finish cuts can be combined. Floor-to-floor time is drastically cut, reducing per-part cost.

These new cutters fully utilize the new advances in machine tool design. More and more shops—those that want a competitive edge—are using them. Why not you?

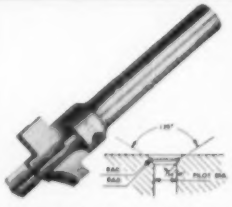
Shell Mills

End Mills


Slab Mills

Staggered-Tooth Side Mills

Interlocking Side or Straddle Mills


Attention! Hydraulic Parts Producers
If you produce A.N.D. 10050 port contours, investigate the Sonnet A.N.D. Port Contour Cutter that completes five operations in one pass!

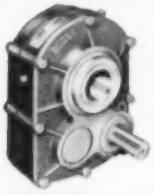
HELICARB TRADE MARK

The original line of standard helical carbide milling cutters.

Manufactured by Sonnet Tool & Mfg. Co.,
579 North Prairie Avenue, Hawthorne, Calif.

DODGE PRODUCTS You Should Know—

FLEXIDYNE
DRIVES & COUPLINGS


TORQUE-ARM
SPEED REDUCERS

DODGE-TIMKEN
PILLOW BLOCKS

Dodge Bulletins you should have—

- Flexidyne Dry Fluid Drives and Couplings. Complete story and selection data. Bulletin A-640-A.
- Torque-Arm Speed Reducers. Technical data and selection methods on all 14 sizes, 1 to 60 hp. Bulletin A-637.
- Rolling Bearings. Load ratings, dimensions and other data on Dodge-Timken and SC and SCM Ball Bearings. Bulletin A-638.

Write for your copies.

DODGE
of Mishawaka, Ind.
DODGE MANUFACTURING CORPORATION
100 Union Street • Mishawaka, Indiana

From the *American Machinist* Library of *Tips for Top Shop Men*

"QUEER DUCKS"—the men that don't fit the pattern—are also the men who don't think like the rest. They'll give you trouble, but they'll usually also give you ideas. Barnyard ducks conform readily to rules, but end up in a pot.

SCHARMANN

FOR RIGIDITY . . . FOR PRECISION FOR LOW COST PRODUCTION

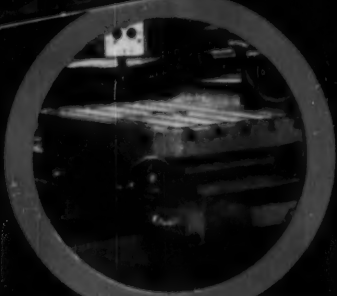
Developed to meet the demands of progress in cutting tools, drives and electrical innovations, the FB Series offers the utmost in rigidity and precision. The wide well braced bed, the massive round column support for the headstock, and the conventional integrally cast column at the rear, concentrically support the boring spindle, preventing any deflections, to provide the maximum in precision.

Infinitely variable drives provide smooth continuous speeds (9.6-1350 RPM) and feeds (.276"-27.6"/min.) over the entire range. Feeds and Rapid Traverse can be imparted to all movements of the headstock and table, including the rotary movement in either direction.

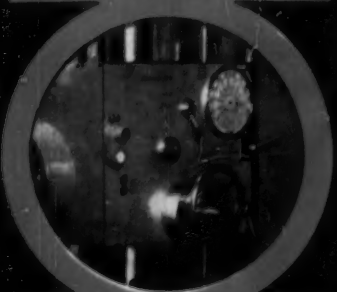
The precision inherent in the design of the FBs can be utilized to the fullest extent with extra SCHARMANN features. The Optical Measuring Device, employing engraved glass scales, microscopes and dial indicators, is accurate to within .0005". Automatic Positioning for headstock vertical travel and table cross travel, allows positioning to within .0005", so necessary in coordinate boring work. For rapid mechanical setting, the Creep Feed, push button controlled from the pendant station, provides jogging in increments of less than .0004". The Automatic Tool Ejector provides for fast tool changeover without damage to spindle or tooling.

Enjoy the modern exclusive SCHARMANN design and construction features that provide precision, quality, and dependable production at lowest cost, year after year. SCHARMANN Service Representatives are located in principal cities everywhere. There is one near-by to assist you.

Write today for additional information.



Solid block construction of table and saddle units with single handwheel for rapid locking, releasing, and pressure relieving of the table.



Simplified, conveniently located headstock controls, showing microscope and dial indicator of optical measuring system, and direct reading speed dia showing both RPM and commonly used cutting speeds in ft./min.

SCHARMANN *Machine Corporation . . .*

Table Types • Floor Types
Portable Types

337 Boulevard of the Allies, Pittsburgh 22, Pa.
HORIZONTAL BORING MACHINES

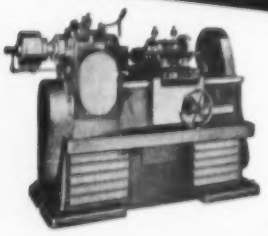
GETTING BETTER THREADS

. . . in Less Time
. . . at Lower Costs
is Coulter Magic!

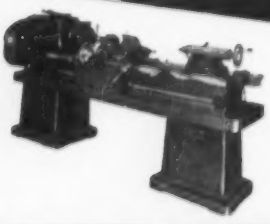
Coulter Threading Machines

Day-in and day-out production figures show that COULTERS produce threaded parts FASTER . . . AUTOMATICALLY . . . on non-ferrous and heat treated metals . . . long and short runs . . . all sizes diameters and lengths . . . high speed production milling. COULTERS start earning their way the moment you make the first threads. Perform with accuracy and ease of handling normally found only on much heavier, more expensive machines.

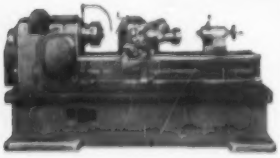
THREE COULTERS ***for your threading needs!*** Each machine has its own design features; engineered for low and high speeds, quick change-overs, individual versatility.



"H1" Completely automatic for precision internal and external right and left hand threads, 4 to 50 per inch. Internal: ⅝" to 8". External: 3/16" to 7".



TYPE "A" MODEL "L1" This is the most versatile lathe built for fast production of Square, Standard and 29 degree threads, internal and external. Has over 25 alternatives for setting up the threading tools. Capacities: up to 195" length of thread.



"THREADMASTER" Produces, automatically, long and short traversing, elevating cross feed lead screws with over 55 changes of the work spindle. Mills threads from 1/3 to 20 per inch and leads from .05 to 5.5".

See for yourself how these rugged COULTER THREADING MACHINES can save you money! Ask your COULTER Dealer about them today, or write direct. Literature and engineering service available, of course.

Machine Tool Builders Since 1896

The James Coulter Machine Co.

635 Railroad Ave. Bridgeport 5, Conn.

FREE—New Bulletin T-1 shows, describes VAILL tube end forming machine VERSATILITY for . . .

Beading • Flaring • Flanging • Sinking
Expanding • Grooving • Threading • Reducing
Double Lap Flaring • Double Lap Flanging

on Tubing up to 6" Diam.

THE VAILL ENGINEERING CO.
135 E. MAIN STREET WATERBURY 20, CONN.

DO YOU DO DRY ABRASIVE CUT-OFF WORK?

ORDER NOW

"Why Do Abrasive Cut-Off Wheels Fail? (Sometimes)."

A 40 page well illustrated informative book giving simple practical advice on such topics as: speed—spindles—flanges—bearings—horsepower—work-holding devices and how to care for wheels.

Send $1.00—cash or stamps

WALLACE TUBE COMPANY
DIV. OF WALLACE SUPPLIES MFG CO.
1304-06 Diversey Parkway Chicago 14, Illinois

Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead

THE DYKEM COMPANY
2301B North 11th St. • St. Louis 6, Mo.

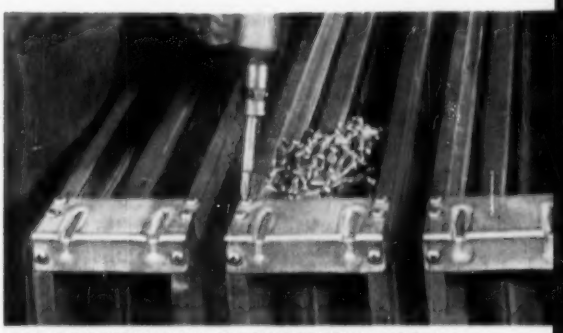
CUT SCRAPER TIME
END NIGHT CLEANUP & MORNING REBLUING

DYKEM HI-SPOT BLUE No. 187 is used to locate high spots when scraping bearing surfaces. As it does not dry, it remains in condition on work indefinitely, saving scraper's time. Intensely blue, smooth paste spreads thin, transfers clearly. No grit; noninjurious to metal. Uniform. Available in collapsible tubes of three sizes. Order from your supplier. Write for free sample tube on company letterhead.

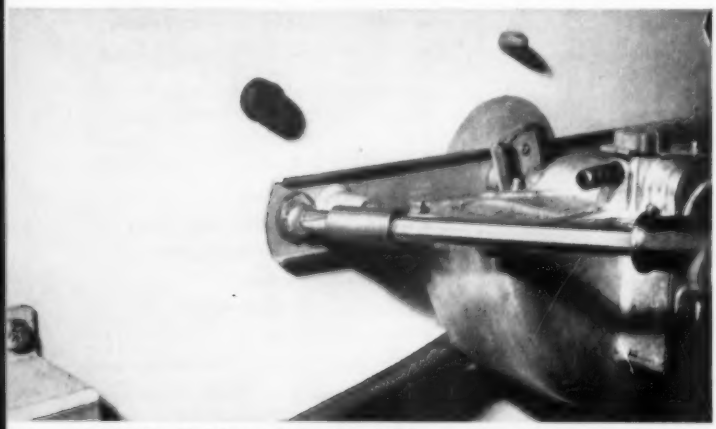
THE DYKEM CO., 2301-8 NORTH 11TH ST., ST. LOUIS 6, MO.

Greater Production - Neater Installation with PHILLIPS CROSS RECESSED HEAD SCREWS

"OUR PRODUCTION INCREASED 50%, and probably even more since the use of power drivers made possible by Phillips head screws," says the Plant Manager of Yankee Metal Products Corporation of Norwalk, Connecticut. Phillips screws have also eliminated damage and have facilitated the ready replacement of signal lenses.



"PHILLIPS SCREWS HAVE REWARDED US with increased production, ease of operation, elimination of damage due to screw driver slippage, longer tool life, more attractive appearance, more positive gripping and more secure fastening," states Mr. Solar, plant manager of Fleet of America, Inc., makers of quality aluminum prime windows and doors.



LINCOLN, division of the Ford Motor Company, uses Phillips Cross-Recessed-Head Screws in the construction of the luxurious Lincoln automobile. The picture above shows Phillips screws being easily installed in the windshield wiper motor of the Lincoln.

MANUFACTURERS OF PHILLIPS CROSS-RECESSED-HEAD SCREWS

THE FASTENERS OF TODAY...
AND OF THE FUTURE
X marks the spot
the mark of extra quality

Pledged to highest standards...

The Phillips Screw manufacturers listed here cooperate to turn out a uniformly high standard of quality. As sponsors of the Phillips Cross-Recessed-Head Standards Committee they adhere to the established dimensional standards, gauges, and gauging methods which will best serve industry.

Members of Screw Research Association

American Screw Company • Atlantic Screw Works, Inc. • The Blake & Johnson Co. • Central Screw Company • Continental Screw Co. Elco Tool and Screw Corporation • Great Lakes Screw Corp. • The H. M. Harper Company • The Lamson & Sessions Company • National Lock Company • The National Screw & Manufacturing Company • Parker-Kalon Division, General American Transportation Corporation Pheoll Manufacturing Co. • Scovill Manufacturing Company • Shakeproof Division Illinois Tool Works • The Southington Hdwe. Mfg. Company • Sterling Bolt Company • Wales-Beech Corporation

"Doc! It's like fighting DERMATITIS with an armored glove."

Except WEST *protective gloves* are invisible.

— quickly applied
— comfortable to wear
— easily washed away.

For skin exposed to oils, dust, grease and grime:

— use PROTECTIVE CREAM #211.

For skin exposed to acids, alkalies and inorganic chemicals:

— use PROTECTIVE CREAM #311.

For skin exposed to organic solvents, acetates and cutting oils:

— use PROTECTIVE CREAM #411.

WEST PROTECTIVE CREAMS protect against hundreds of troublesome industrial irritants.

Too, they're antiseptic. Inhibit harmful bacteria with Hexachlorophene. And most important, they protect *for extended periods of time.*

LET a specially trained WEST representative tell you more about WEST PROTECTIVE CREAMS and the WEST Dermatitis Control Program. Just write. Or telephone your local WEST office.

Largest Company of its kind in the World

75th ANNIVERSARY
WEST DISINFECTING Company

FREE BOOKLET

Use your business letterhead to request our 24 page booklet on controlling skin irritation.

WEST DISINFECTING COMPANY
Dept. AM, 42-16 West St.
Long Island City 1, N. Y.

Branches in Principal Cities • In Canada: 5621-23 Casgrain Avenue, Montreal

CM
Lodestar®

ENTIRELY NEW
differently NEW

CAPACITIES: from ⅛ to 1 ton. Single and 3 phase. ¼ ton model weighs only 51 pounds.

$149.50
and up

Built to serve you for its normal life without costly maintenance

... the first truly "heavy duty" version of the small electric hoist.

... complete flexibility — interchangeable suspension — quick voltage change.

FEATURING:

- Push Button Control
- Self-Adjusting Heavy Duty Brake
- Sealed-in Lifetime Lubrication
- Overload Protection
- Fully Enclosed Components
- Lowest Headroom
- "CM-Alloy" Flexible Link Chain

WRITE US
or call your CM distributor for literature, prices and quick delivery from stock.

CM
HOISTS AND CHAIN

CHISHOLM-MOORE HOIST DIVISION
Columbus-McKinnon Chain Corporation
Tonawanda, New York
Regional Offices: New York • Chicago • Cleveland
In Canada:
McKinnon Columbus Chain Ltd., St. Catharines, Ont.

WORMS & WORM GEARS

•

ALL TYPES
AND
ALL
MATERIALS

•

BILGRAM GEAR & MACHINE WORKS
1217-35 Spring Garden, Philadelphia, Pa.

When does surface smoothness begin to waste your money?

In most plants today when a design engineer specifies a certain finish for a part, no one in production knows whether the part will be overmachined, O. K., or too rough until that part reaches the inspection department.

By then it is too late.

The costly consequence is that the company loses money on every part finished too well, AND on every reject resulting from underfinishing. Surface finish begins to waste your money at two precise points . . . *the moment you finish a part a single microinch better than the job requires, and the moment you finish a part a single microinch worse than required.*

Surprising as it may seem, most in-process checking today consists of judging how the finish *looks* and how it *feels* because no accurate, portable, in-process checking equipment has been available. The production department had no tool that could instantly tell the machine operator when he had met the specification.

The Brush Surfindicator takes the costly guesswork out of finish control. Fully portable . . . weighs only 15 pounds.

What has been done?

Brush has developed an amazingly rugged electronic surface measuring device called the SURFINDICATOR* which can be carried anywhere in the shop to obtain an instantaneous, accurate in-process measurement of roughness on any surface – flat, round or inside-a-hole.

Now you can set up optimum specifications for surface finish based on your laboratory or pilot model tests . . . and then hand a reliable instrument to the production department to help them meet those specifications with no waste of worker or machine time. You can mount SURFINDICATORS at each machine or set up checking stations throughout the plant. And your regular machine operators can use them . . . it doesn't take an expert.

How It Works

All the user does is pass the stylus over the surface in question and take a direct reading. It's simple, fast, accurate and above all it's practical . . . for metallic surfaces and for glass, porcelain, plastic, paper and other materials.

This new booklet on the Brush Surfindicator includes the new ASA standards . . . will help you establish economical surface finish control.

You should know all about this portable device, its many, many uses and the savings it can mean to your company. We tell the whole story in a new booklet which also includes the new ASA standards on surface finish for industrial use. Write for your copy today on your company letterhead. *T.M.

BRUSH ELECTRONICS COMPANY

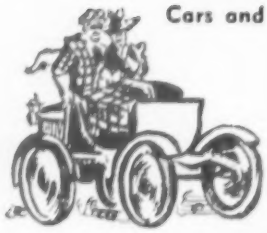
3405 Perkins Avenue, Cleveland 14, Ohio

BRUSH 76 ELECTRONICS

DIVISION OF CLEVITE CORPORATION

YESTERDAY...

Cars and taps gave low "mileage".



TODAY...

the cutting characteristics and life of your taps are important factors in your costs of production.

BLAKE Flute and Chamfer Grinders can make substantial savings possible in your threaded-hole costs. They do this by creating or restoring:

1. Exact indexing of cutting edges.
2. Efficient rake angles for each job.
3. Correctly ground spiral points.
4. Perfectly relieved chamfers.

The accuracy and dependability of the Blake Flute Grinder and Blake Chamfer Grinder make it possible for you to do high-efficiency tapping . . . the *only* kind which pays off in profits today!

Send for the details now.

EDWARD BLAKE COMPANY INC.

MANUFACTURERS OF FLUTE AND CHAMFER GRINDERS

435 CHERRY ST., WEST NEWTON 65, MASS.

Exclusive Distributors of:
BLACK DIAMOND PRECISION-DRILL GRINDERS • SURFACE FINISH STANDARDS • WORCESTER DRILL GRINDERS

TOOL WEAR...–75%
MACHINING SPEED...+100%
ON THIS GRAY IRON RING

...thanks to

FERROCARBO®

Users everywhere report similar experiences. In fact, on 67 machining tests in 11 large machine shops, castings of gray iron treated with FERROCARBO averaged 89.5% greater machinability per tool than untreated castings. These premium castings are finer-grained, denser, stronger, yet they COST YOU NO MORE...because your foundryman, using FERROCARBO, makes worthwhile savings in raw material costs.

FOR FREE BOOKLET on FERROCARBO, citing actual case histories of faster machining, with longer tool life, write The Carborundum Company, Dept. 13, Niagara Falls, N.Y.

CARBORUNDUM®

How to estimate the time element in any machining job

Use this manual to make the winning but safe bids that mean more jobs and better profits for your shop.

Machine Shop Estimating

BY W. A. NORDHOFF
Douglas Aircraft Company, Inc.

486 pages, 480 illus., $7.00

Here's the kind of on-the-job help you need to make quick, reliable estimates of the time it takes to do the different machining operations in any machine-shop large or small. Whether a job involves drilling, boring, tapping, threading, grinding—or any of the scores of other operations—this handy manual tells you exactly what to consider in estimating job time.

It covers every step—from setting up a job, to tearing it down—giving the specific time value established for each element. The various non-machining operations which enter into the cost of any job are also given. Instructions are provided for the use of several methods of estimating particular jobs on each type of machine in use today.

SEE THIS BOOK 10 DAYS FREE

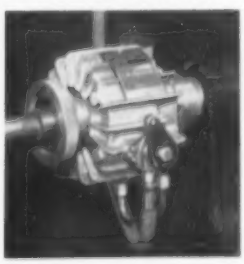
McGRAW-HILL BOOK CO., INC.
330 W. 42nd St., NYC (10)

Send me Nordhoff's MACHINE SHOP ESTIMATING for 10 days' free examination on approval. In 10 days I will remit $7.00 plus few cents for delivery, or return the book postpaid. (We pay for delivery if you remit with this coupon; same return privilege.)

(Print)
Name .....
Address .....
City ..... Zone ..... State .....
Company .....
Position PA-4-9-56

This offer applies to U.S. only.

STEP UP PRODUCTION 20% +



. . . for most lathes to 1" bar stock capacity

- Holds delicate parts without damage or adjustment
- Iron grip for heavy work
- No adjusting for stock or part variations
- Finger-tip or foot control eliminates operator fatigue
- Eliminates jarring of head stock

(Ten day FREE TRIAL to reliable firms)

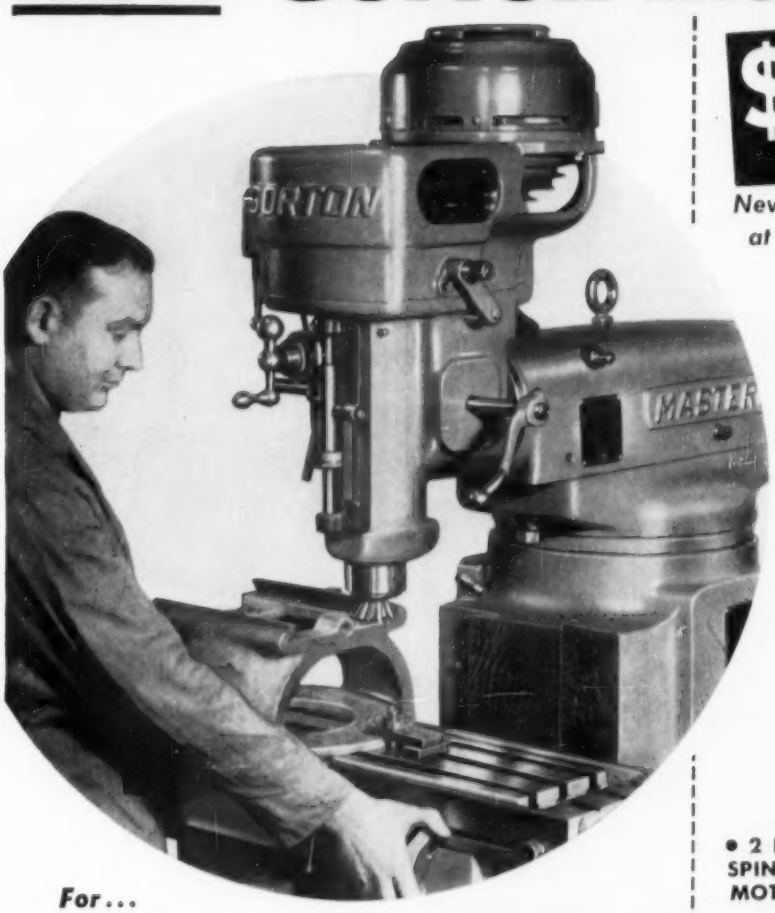
WILSON AIR COLLET CLOSER, INC.
909 40th Ave., NE, Minneapolis 21, Minn.

PRODUCTION METHODS at GRAFLEX

Here are details of unique precision production methods at Graflex, Inc., Rochester. An *American Machinist* Special Report. 20 pages, illustrated, 25 cents a copy.

READER SERVICE DEPT.
American Machinist
McGraw-Hill Building
New York 36, N. Y.

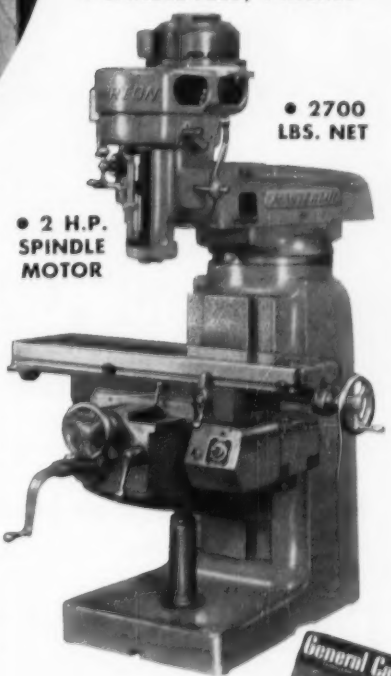
NEW Gorton Mastermil



$2750
(WITH ELECTRICS)

Never before a machine like this at a dollar a pound!

- PRECISION SPINDLE; 10 SPEEDS, 80-5600 R.P.M. STANDARD
- DESIGNED AND BUILT TO PROVIDE SUSTAINED ACCURACY
- LONGITUDINAL FEED, 22 INCHES
- SADDLE LENGTH, 24 INCHES
- CROSS FEED, 10½ INCHES
- VERTICAL FEED OF KNEE, 15¼ INCHES
- SPINDLE FEED, 4 INCHES



- 2700 LBS. NET
- 2 H.P. SPINDLE MOTOR

For...

Milling, boring, duplicating in tool rooms, model shops, pattern shops, production lines, general machine shops, experimental laboratories, machine shops, schools — wherever high-speed vertical milling is done.

Also available...

Infinitely variable spindle feed from ¼ inch to 8 inches per minute.

Infinitely variable table feed (longitudinal) in 4 ranges: from ½ inch to 60 inches per minute.

Ask for special bulletin, No. 2699, on new Gorton Mastermil and for general catalog, 1504-1655, covering the entire Gorton line.

GORTON

SINCE 1893

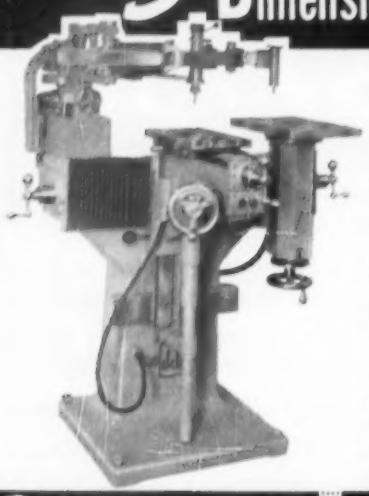
GEORGE GORTON MACHINE CO.

1504 Racine Street — Racine, Wisconsin, U.S.A.

Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

A 8752-1P

3-Dimensional panto-miller



For accurate pantograph milling on all 3-dimensional work, the "Panto-Miller" 3A is a sturdy production machine. Accurately reproduces copy on flat or curved surfaces, in reduced or magnified size.

NEW:

Capacity for workpiece height.
Sensitivity of linkage.
Range of pantograph ratios.
Accuracy of reproduction.
Finger-Tip Control of spindle speeds.
Ease of operation.

The new Panto-Miller 3A is an economical answer to many standard and special production problems. Write for Bulletin PM3, which gives details and specifications.

2-Dimensional panto-miller

Versatile and dependable for continuous service, the J & B "Panto-Miller" 2A:

Engraves
Profiles
Die Cuts
Mills

Investigate its advantages for your own applications. Send for Bulletin PM2

3-WAY Indexing Trunnion

Simple, Rapid, Positive positioning of workpiece or jig for all angle Drilling, Tapping, or Counterboring. Available with Chuck, Faceplate, or Right Angle Adaptor Plate. Complete with Station Selector. For details, ask for Bulletin 173.

WITH RIGHT ANGLE ADAPTOR

WITH FACE PLATE

J&B
EST 1870

JOHNSON & BASSETT, INC.
PRODUCTION TOOL DIVISION
WORCESTER, MASSACHUSETTS

Order any of the full line of STAR Hand and Power Hacksaws, Metal and Wood Cutting Bandsaws and Hacksaw Frames from your Industrial Distributor.

Industry prefers STAR quality, prefers the blades made of carefully heat-treated, top-quality steel, fabricated on specially designed equipment – because STAR consistently delivers fast, economical metal cutting and long blade life.

Be sure to ask your Industrial Distributor for STAR "Moly"® High Speed Steel Blades. STAR developed this high speed, heavily-alloyed steel blade of molybdenum. Remember, "Moly" High Speed blades outlast standard steel blades 10 to 1, cut as well as the *best* high speed steel blades made, but are substantially lower in cost.

FREE! Ask your Industrial Distributor for a supply of our NEW Metal Cutting Booklets and Wall Charts.

® 1957

Sold Only Through Recognized Distributors

CLEMSON BROS., Inc.
MIDDLETOWN, N. Y., U. S. A.

Makers of Hand and Power Hacksaw Blades, Frames, Metal & Wood Cutting Band Saw Blades and Clemson Lawn Mowers.

From the *American Machinist* Library of *Tips for Top Shop Men*

THERE'S always a way. Remember the college that got a bequest of several hundred thousand dollars for a new girls' dormitory — which the will stipulated must be surrounded by a 20-ft wall. A smart trustee suggested the bequest be accepted and the dorm be built—with the wall in a 20-ft trench.

It should pay you too!

"Hill" Horizontal Spindle Grinder for a wide range of precision grinding. Made in table widths of 18", 24", 30" and 36" — table lengths from 5 to 20 feet.

"Hill" Vertical Spindle Grinder for rapid stock removal. Made in table widths of 18", 24" and 30" — table lengths from 5 to 20 feet.

Every manufacturer of heavy duty precision surface grinding equipment has:

- √ **Testimonials from satisfied users.**
- √ **Records of fine finishes produced.**
- √ **Case histories of phenominal savings over other finishing methods.**

But there are other important factors that should be considered:

- √ **Maximum accessibility and control simplicity.**
- √ **Minimum maintenance over the years.**
- √ **Longer accurate production life due to proven design methods, rigid construction and vibration-free operation.**

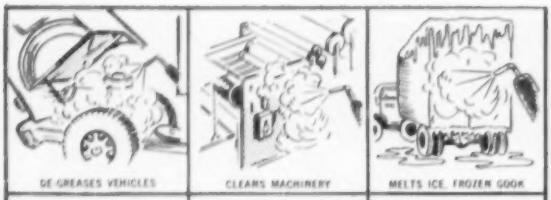
It has always paid the users of HILL Open Side Hydraulic Surface Grinders. It should pay you too!

Look for the added considerations before you buy!

THE HILL ACME COMPANY

1209 WEST 65th STREET • • • CLEVELAND 2, OHIO

"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING • THREADING TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES • SHEAR BLADES



VAPOR BUILT
UPGRADER JR.
STEAM CLEANER

COMPARE! COSTS 1/3 LESS

this steam cleaner saves hard cash on dozens of tough maintenance jobs

You'll save HUNDREDS—of dollars and man-hours—with a Vapor Upgrader Jr. Steam Cleaner. Its initial cost is one-third lower than comparable machines. Compact, portable. One man and the Upgrader Jr. can do 95% of all steam-cleaning jobs in less time, at lowest cost. Pressures up to 125 p.s.i. Controllable output, 100 g.p.h. It's safe, simple—easy to transport, to use. Write today.

VAPOR HEATING CORPORATION

Also manufacturers of high-volume, forced-air WAIKIKI Heaters

80 E. Jackson Boulevard, Chicago 4, Illinois

Vapor Car Heating Co. of Canada Ltd., 65 Dalhousie St., Montreal 3

VAPOR HEATING CORPORATION, 80 E. Jackson Blvd., Chicago 4 Ill. Dept. D-11

Please send me free new Bulletin on:

☐ UPGRADER JR., ☐ Waikiki Heaters

☐ Send me information about your Time Payment Plan.

Individual _____ Title _____

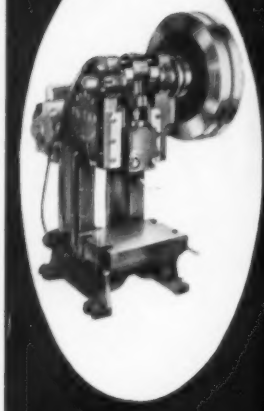
Company _____

Street _____

City _____ Zone _____ State _____

KENCO

1½ TO 15 TON
PUNCH PRESSES



PRECISION-BUILT FOR FAST, TROUBLE-FREE PRODUCTION

Here at last is a complete line of small punch presses built to big press standards. You get rugged construction throughout . . . minimum need for adjustments . . . minimum downtime . . . capacity far beyond the ratings . . . steady, economical production.

Write for literature and engineering data.

Trouble-free crankshaft has no weakening slots . . . eliminates driving-dog breakage. One-piece, alloy steel construction.

Flywheel driving plate is hardened and ground, assuring long wear and positive drive—a quality feature exclusive with KENCO presses.

KENCO MANUFACTURING CO.

Mfrs. of Precision Machinery and Accessories

5211 Telegraph Road
Los Angeles 22, California

ENAMELED METAL PRODUCTS

ARE HOT STAMPED IN COLOR WITH THIS ACROMARK NO. 2AH HOT STAMPING MACHINE WITH DIAL FEED.

IT WON'T MARK PORCELAIN ENAMEL THOUGH.

ACROMARK Company

7-13 MORRELL ST., ELIZABETH 4, N. J.

Abrasive Cent-R-Lap Tool

Saves time, eliminates diamond dressing. Cones changed in seconds. Available in 2 sizes, ⅜" and ¾" Cent-R-Laps and abrasive cones in leading grits. Write for descriptive literature and prices.

J. R. REICH MANUFACTURING CO.

201 E. Stroop Rd. Dayton 9, Ohio

RUSSELL
HYDR. SAWING MACHINES

All sizes up to 14" capacity, with and without automatic stock feed

Ask for catalogs

TRIPLEX MACHINE TOOL CORP.

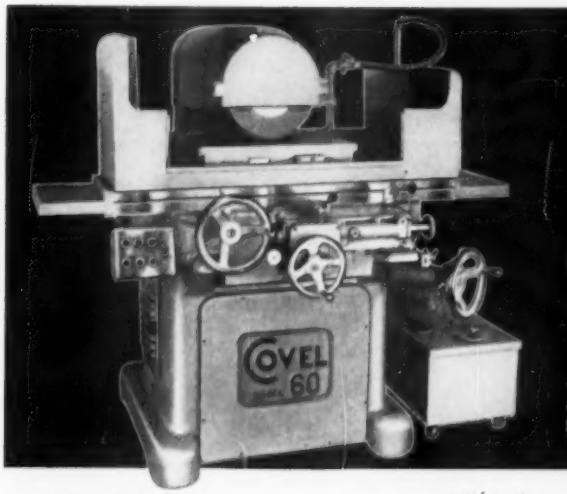
75 West St. New York 6, N. Y.

POPE PRECISION SPINDLES for Grinding, Boring, Milling

Belt Driven · Motorized · High Cycle · Special

Let us send you Data Sheets

POPE MACHINERY CORP., 261 River St., Haverhill, Mass.



Compare THESE FEATURES...

COVEL HYDRAULIC SURFACE GRINDERS

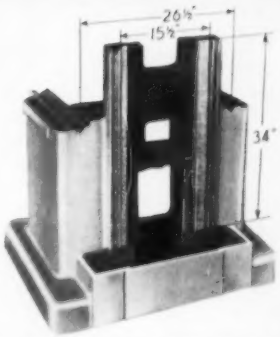
Available in three sizes

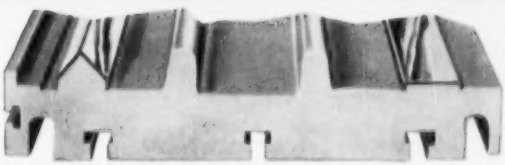
	No. 20	No. 35	No. 60
Work capacity	6"x18"x12"	8"x24"x11"	14"x24"x15"
Grinding wheel	10"x¾"x3"	12"x¾"x3"	14"x1"x3"
Spindle motor, HP	1½	2	3

ONE-PIECE BASE

Vertical and cross ways are integral for permanent alignment.

Length of vertical ways.....34"
Width of vertical ways.....15½"
Distance between double V cross ways.....26½"
Weight of base, 1570 lbs.





HARD CHROME TABLE WAYS

Special Covel plating process applies hard chrome surface direct to the close grain, alloy cast iron surface of V and flat table ways *after* they are precision hand scraped from a master plate. Tables in service for over five years show but slight wear, no flaking. Available at extra cost.

HARDENED AND GROUND LEAD SCREWS

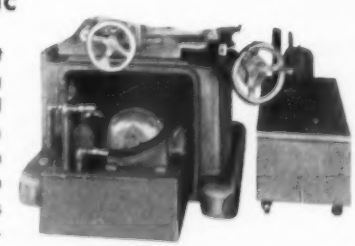
Made of best quality tool steel, Covel cross feed and elevating screws are hardened and ground to insure long-lived precision operation.

ELEVATING HAND WHEEL

Located *below* the level of the table where the operator can read the graduations easily and keep an eye on the work.

CLOSED HYDRAULIC SYSTEM

Prevents dirt or coolant from contaminating the hydraulic oil. Covel low pressure system throughout. 15 gallon oil reservoir located in base of machine slides out for easy maintenance.



THREE SPINDLE SPEEDS

This Covel cost reducer makes it easy to obtain proper peripheral speed for the grinding wheel even after wheel has been worn down. Permits use of worn wheels without loss of grinding efficiency. Cartridge-type sealed-for-life anti-friction spindle, V-belt driven.

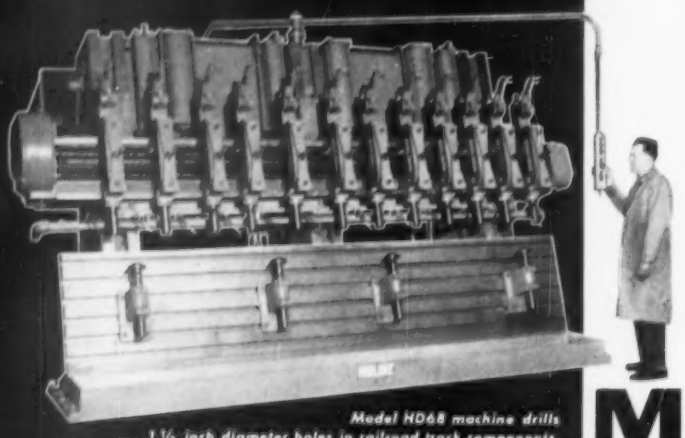
These features, plus many others, are reasons why Covel is rated "tops" in surface grinders. Write or 'phone for full information.

COVEL PRECISION GRINDERS

HYDRAULIC & HAND FEED SURFACE GRINDERS
UNIVERSAL CUTTER & TOOL GRINDERS • DRILL GRINDERS

DEPT. AM-86
BENTON HARBOR, MICHIGAN
WAlnut 6-6157

FOR GREATER . . .



Model HD6B machine drills 1 1/2 inch diameter holes in railroad track components.

MOLINE

PRODUCTION • EFFICIENCY • SAVINGS

Use an individually designed "Hole-Hog" Machine Tool for such jobs as:

- Multi-Spindle Boring
- Single and Multi-Spindle Honing
- Straight Line Multi-Drilling
- Adjustable Spindle Drilling
- Vertical and Way-Type Fixed Center Drilling, Boring and Tapping
- Special Multiple Operation Machine Tools

Over 50 years of Machine Tool Engineering experience is at your service. Tell us your particular problem.

MOLINE TOOL CO. HOLE-HOG MOLINE, ILLINOIS

Representatives in principal cities.

104

MOLINE TOOL COMPANY
100 20TH STREET MOLINE, ILLINOIS

KEEP THOSE GOOD IDEAS AT YOUR FINGERTIPS . . .

with smart, compact Jesse Jones Files. Keeps your copies of *American Machinist* clean, centralized, accessible, at your home, library or desk. Each file holds 10 copies.

Durable . . . they support 150 lbs . . . each file is covered with rich red-and-black plastic . . . looks and feels like leather . . . washable, permanently attractive . . . 16 carat gold lettering.

And they're reasonably priced! Only $2.50 each, 3 for $7.00, 6 for $13.00, shipped postpaid. Add $1.00 for orders shipped outside U.S. Satisfaction unconditionally guaranteed or your money back.

State number of *American Machinist* files you want, and send check or money order to:

JESSE JONES BOX CORP.
P.O. Box 5120, Philadelphia 41, Pa.

The NEW **AMERICAN MACHINIST'S HANDBOOK**

Edited by
RUPERT LE GRAND
Senior Associate Editor, *American Machinist*
Based upon earlier editions of
AMERICAN MACHINISTS' HANDBOOK
edited by Fred H. Colvin and Frank A. Stanley
1579 pp., 5⅛ x 8, 774 illus., $11.00

Here's the biggest news in years for machinists, toolmakers, apprentices, designers, engineers, inspectors—in fact *all* in the metal working industry. Now you can have the on-the-job help of an *amazingly improved, fully up-to-date,* NEW AMERICAN MACHINIST'S HANDBOOK.

Long a highly-regarded working tool, this book now has been completely revised and modernized in every way to make it a practical companion for technical men. Whether it's in design and drafting—machining and forming methods—metal finishing—or other major phases of your work—your problem can be better answered, solved more quickly, easily, and dependably with the aid of the wealth of modern descriptions, practices, and data given in this book.

The facts behind this monumental change

Think of the advances of recent years in metalworking in all its aspects—not only the normal development of better tools and techniques in an important industry, but also the further advances demanded by work on new materials and new design applications! *The growth in metalworking technology, standards, and practice has been tremendous* — faces every man in the field with a great need for new working information. To meet this urgent need, the NEW AMERICAN MACHINIST'S HANDBOOK has been created — fully abreast of today's practice—and given to you with the practical treatment and handy reference features that will make this the "bible" of the industry for many years.

BIGGEST IMPROVEMENT IN NEARLY 50 YEARS!

80% rewritten
Rearranged to give more facts—easier reference.
Fully up-to-date
1579 pages
774 illustrations
45 big sections

Gives day-to-day help in your work

The NEW AMERICAN MACHINIST'S HANDBOOK is so concisely written, so logically arranged, so packed with facts, that you'll find it of almost daily use in your work. Look up in it questions, large and small, on layouts, feeds, speeds, tools, jigs, fixtures, materials, standards, tolerances, forming and finishing methods—hundreds of details of machine shop and drawing room practice. You'll find the authoritative answers that will mean time and money saved and better results in all your work. See for yourself—have the book at your elbow—consult it for 10 days at our risk. No obligation to keep it unless it meets your needs. Just mail the coupon below.

10 DAYS' FREE EXAMINATION

McGraw-Hill Book Co. Dept. A-4-9
327 W. 41 St., N.Y.C. 36

Send me Le Grand's NEW AMERICAN MACHINIST'S HANDBOOK for 10 days' examination on approval. In 10 days I will send $11.00 plus few cents for delivery costs or return book postpaid. (We pay delivery costs if you send remittance with this coupon; same examination and return privilege.)

(Print)
Name _____
Address _____
City _____ Zone _____ State _____
Company _____
Position _____
For price and terms outside U.S., write McGraw-Hill Int'l., N.Y.C. A-4-9

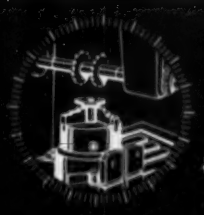
NEW

ERICKSON

MASTER SPACER

with No. 0 Timken Bearings

gives increased production and optimum accuracy in

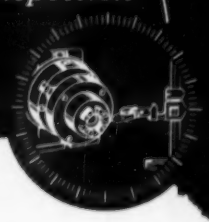


straddle milling

milling

jig drilling
with either micrometer or "Jo" block setting

inspection



Write for free catalog "*Erickson Master Spacer*" today. And at the same time request your copy of Catalog K; you'll find cost-slashing applications for all Erickson holding tools.

The new Erickson Master Spacer quickly and accurately positions work for a wide variety of jobs. This *one* tool can eliminate expensive jigs and fixtures . . . makes it a simple procedure to set up drilling, milling, boring and special machining operations.

The new Erickson Master Spacer, ideal for tool room and production machining, assures outstanding performance under heavy helical cuts and slow feeds. *Indexing accuracy guaranteed within .001-inch cumulative error on a 6-inch diameter circle.* Jig drilling is possible with either micrometer or "Jo" block setting. Timken bearing construction permits work to be trued in position with brake off because spindle alignment remains unchanged.

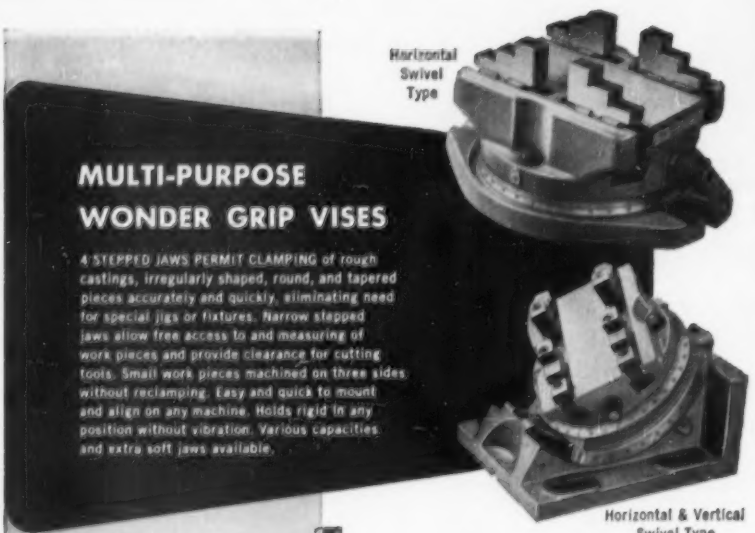
The new Erickson Master Spacer can help you come to grips with your Number One Problem—high production costs. The first step is to get the Erickson story.

AA-3091

ERICKSON TOOL COMPANY

2309-4 Hamilton Avenue • Cleveland 14, Ohio

COLLET CHUCKS • FLOATING HOLDERS • TAP CHUCKS • TAP HOLDERS • AIR-OPERATED CHUCKS
EXPANDING MANDRELS • EXPANDING-COLLETS • SPECIAL HOLDING FIXTURES



MULTI-PURPOSE WONDER GRIP VISES

4 STEPPED JAWS PERMIT CLAMPING of rough castings, irregularly shaped, round, and tapered pieces accurately and quickly, eliminating need for special jigs or fixtures. Narrow stepped jaws allow free access to and measuring of work pieces and provide clearance for cutting tools. Small work pieces machined on three sides without reclamping. Easy and quick to mount and align on any machine. Holds rigid in any position without vibration. Various capacities and extra soft jaws available.

TAPPING ATTACHMENTS

Reversible safety tapping attachments with adjustable graduated friction drive, hardened, ground and lapped, complete with torque bar and handles. Precision made throughout by long established reputable West German factory.

DISTRIBUTOR INQUIRIES INVITED

Also United States Distributors of European Machine Tools

Tested for Performance to High Amer. Standards
Immediate Delivery from N.Y. Stock

MADE IN GERMANY

Low Competitive Prices

- Quick Change Chucks and Collets
- Wille-Grip Keyless Drill Chucks
- Milling Machine Arbors, Adapters, Arbor Spacers and Bearings
- Lathe Mandrels

MBI

Our Headquarters in New York City

Write for complete details and prices to Dept. 20

M.B.I. EXPORT & IMPORT LTD.

A Division of Machinery Builders Inc.

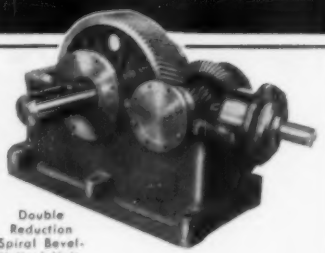
475 Grand Concourse, Bronx 51, N. Y.

"Over 20 years experience in designing and building machinery"

CABLE ADDRESS: Machbuild New York

Phone: MOtt Haven 5-0900

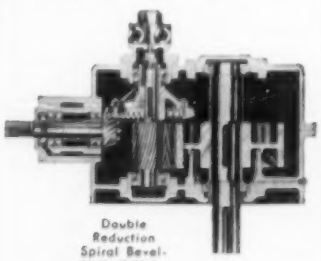
You... get more to Start With



Double Reduction Spiral Bevel-Helical Unit.

A glance at illustrations shown, will convince you of "plus features" of these quality built reducers • Gears are Spiral-Bevel and Helical types to assure quiet operation at high speeds, and increased tooth strength • Pinion shafts are integral with gears and finished to close tolerances by grinding • Ball or Roller Bearings support shafts and are designed to take combined radial and thrust loads • Housings are quality grey cast iron with all points of stress properly ribbed to reduce deflections and stresses to minimum; also housing design provides adequate oil reservoir and large radiating surface for thermal capacity • Vertical Units are equipped with "dry well," which keeps oil from leaking at low speed shaft. Hundreds of Philadelphia Spiral-Bevel Helical Units are used throughout industry, driving Paper Machines, Conveyors, Autoclaves, Blowers, Draw Benches, Fans, Chillers, Machine Tools, Laundry Machinery, Cement Machinery, Rubber Mill Machinery, Wire Drawing Machinery, etc.

Be convinced, send for Catalog # SB-50, which describes all types of Horizontal and Vertical Spiral-Bevel Helical Units.



Double Reduction Spiral Bevel-Helical Unit, Vertical Type.

WHOOT MON!

You really get your money's worth when you buy precision screw machine products made by "you know W.H.O.*"

CAP SCREWS • COUPLING BOLTS
SET SCREWS • MILLED STUDS
. . . our specialty.

Wm. H. Ottemiller Co. YORK, PENNA.

PHILADELPHIA GEAR WORKS

INCORPORATED

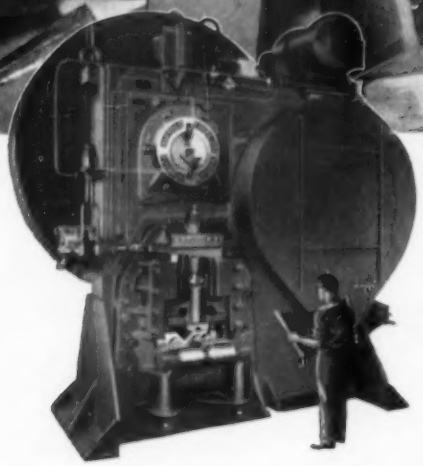
ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA
BALTIMORE • CLEVELAND

Virginia Gear & Machine Corp., Lynchburg, Va.

Industrial Gears & Speed Reducers • Limitorque Valve Controls

Established 1917



No. 17 Billet Shear. Capacity, 10" rounds or 9" squares, 6 strokes per minute.

"Buffalo" Billet Shears are built in 11 sizes to handle *your* size rounds, squares or flats. The smallest one shears thirty 2¼" rounds per minute; the largest, six 10" rounds per minute. Rigid arc-welded steel plate frames —"power" lubrication—air operated clutches, counterbalance and hold-down—are some of the "Q" Factors* that assure you years of service with practically no maintenance.

a "Buffalo" billet shear did it all in 10 minutes!

You're looking at a hundred 7" square billets readied for forging in just ten minutes by a "Buffalo" No. 15 Billet Shear with automatic feed table and back gage. This is just a sample of the high output of "Buffalo" Billet Shears in the nation's leading shops.

And note the clean, square faces of each cut. There's no smearing to conceal porosity, as with burning or sawing. The shear penetrates only 3/16", localizing a neat, accurate vertical fracture. Divisions are uniform in dimensions and weight. Your quality keeps up with your speed!

Write for Bulletin 3295-C for all details.

**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

ESTABLISHED 1877 "Buffalo" MEMBER N.M.T.B.A.

BUFFALO FORGE COMPANY

Machine Tool Division

509 BROADWAY BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING SHEARING BENDING

STEEL
Stanho
PRODUCTS

Taper Pins
made solid for
✓ STRENGTH
✓ SAFETY
✓ ACCURACY

Stocked in all sizes #7/0 thru #14.

Special diameter sizes made to order

"Stanho" makes a complete line of SOLID Taper Pins, Straight Pins, quality Cotter Pins, Woodruff Keys, Machine Keys and special parts to order.

Proven Durability plus Precision and Economy... Clean Bright Finish

"Stanho" Taper Pins are made from selected steel bars, microscopically free from any defects. Milled or centerless ground precision types. Also available made from Stainless Steel, Monel, Brass, Aluminum or other metals to your specifications.

Prompt shipments . . . in bulk or conveniently packaged.

Write for catalog and prices

STANDARD HORSE NAIL CORP
Since 1872
NEW BRIGHTON PA

WORLD'S HARDEST METAL

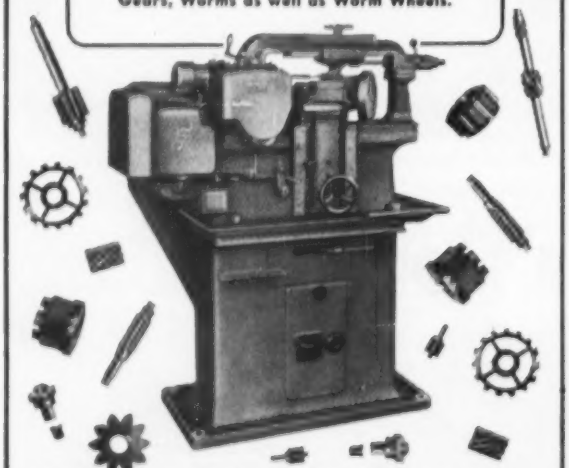
● New, improved TALIDE METAL is uniform in quality—gives top performance on ALL cutting, drawing and wear-resistant applications. Write for Catalog 56-G. METAL CARBIDES CORP., Youngstown 12, Ohio.

METAL CARBIDES CORPORATION
TALIDE
YOUNGSTOWN 12, OHIO

HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • CERMETS • HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

KOEPFER GEAR HOBBING MACHINE

A Universal Purpose Machine for the economical production in either small or large quantities of Spur Gears and Pinions, Spiral Gears, Worms as well as Worm Wheels.



WRITE FOR ILLUSTRATED FOLDER

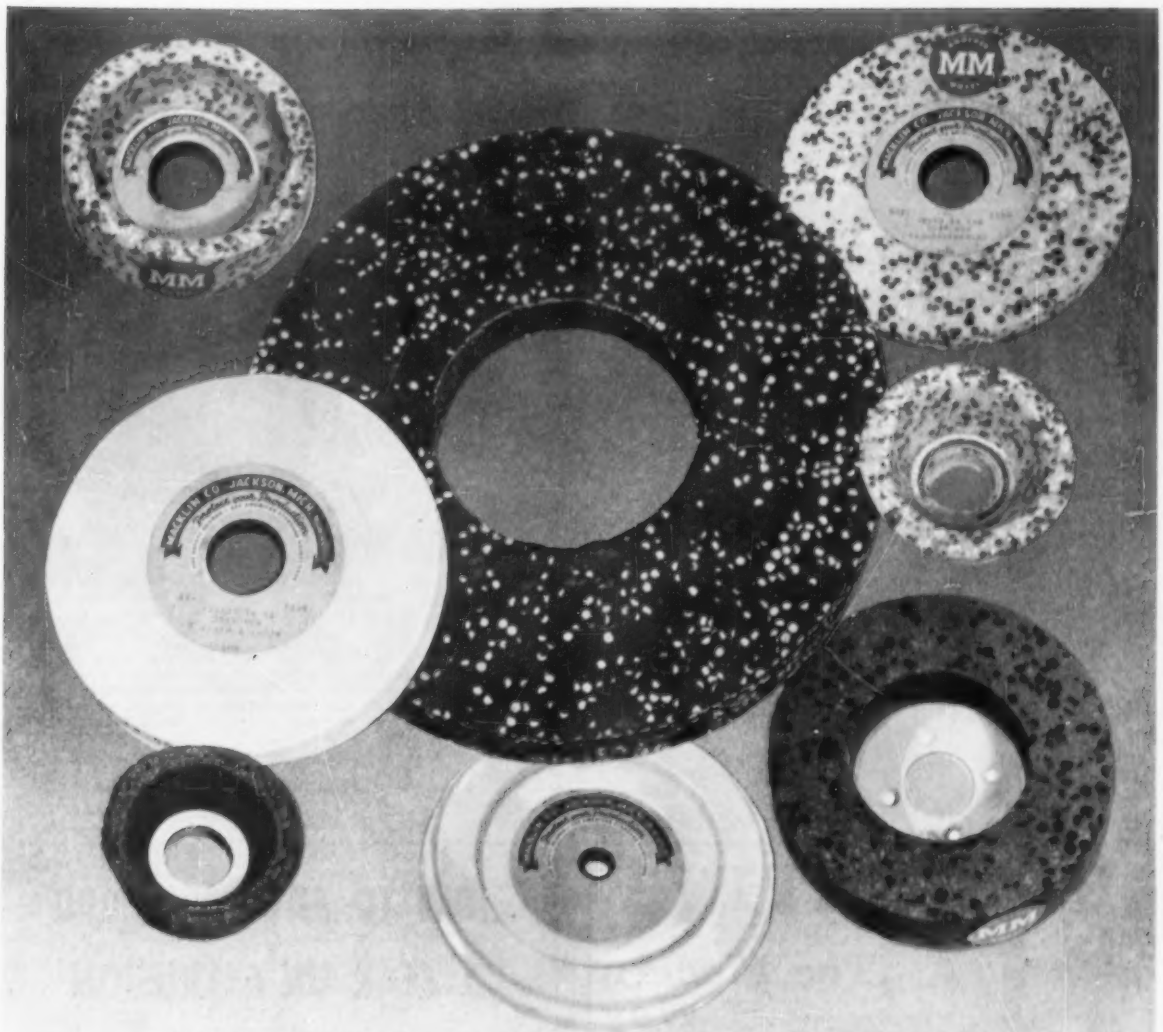
GEORGE SCHERR CO., Inc.
COMPLETE LINE OF PRECISION INSTRUMENTS
200 AM LAFAYETTE ST. • NEW YORK 12, N. Y.

FREE... 64 PAGE CATALOG

WORLD'S LARGEST LINE OF WORK HOLDING EQUIPMENT—CHUCK JAW BLANKS, CAST ALUMINUM AND MALLEABLE KNOBS, WHEELS, HANDLES—PLUS HUNDREDS OF OTHER JIG AND FIXTURE COMPONENTS

COMPLETE DETAILED SPECIFICATIONS
ENGINEERING DRAWINGS • COST SAVING DATA
write for your copy—TODAY!

JERGENS TOOL SPECIALTY CO.
Dept. AM-4, 712 E. 163rd St., Cleveland 10, Ohio



Will you give us *YOUR* opinion?

Since the first acceptance of Macklin M M process wheels, scores of enthusiastic reports have been received from satisfied users. Do you have a difficult grinding job? Give M M a trial, we would appreciate your opinion.

Call for the services of a Macklin field engineer.

MACKLIN COMPANY

Manufacturers of GRINDING WHEELS AND OTHER ABRASIVE PRODUCTS

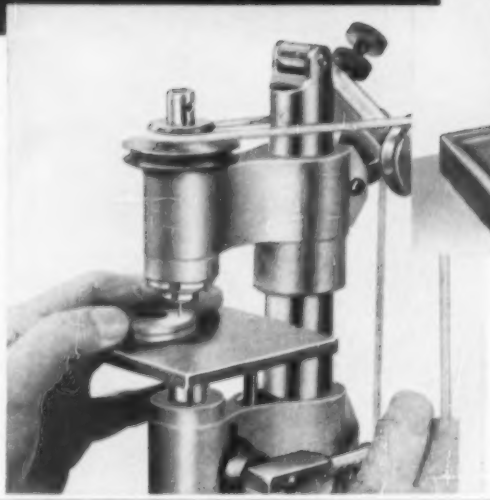
JACKSON, MICHIGAN

SMALL DRILLS MUST BE HELD
IN PRECISION COLLETS TO ASSURE ACCURACY

LEVIN MICRO-DRILL PRESS

FOR VERY SMALL HOLES
DOWN TO .002"

In the LEVIN micro-drill press drills are held in precision collets. Runout is reduced to practically zero and drill breakage from this cause is eliminated. Collets are available in a complete range of sizes down to .1 mm (.004").



Size of table is 3-3/4" x 4". Maximum table travel is 1-1/2". Greatest distance between table and end of spindle 4". Preloaded ball bearing spindle with four speeds 1725, 2600, 3000, 4700 RPM. Motor 1/2 HP, 110V, 60C. The micro-drill press may also be had with a 3450 RPM motor, doubling the above speeds.

Send for catalog M describing complete line of micro-drilling equipment, collets, instrument lathes and precision tools.

LOUIS LEVIN & SON, INC.
3610 South Broadway • Los Angeles 7, Calif.

KEYSEATING
The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1" in width.

Great simplicity and ease of operation of Davis Keyseater, assure the user of accurate, time saving work.
Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY
403 EXCHANGE ST. ROCHESTER, N. Y.

HOW TO SAVE $300,000 A YEAR ON EXTRUSION SCRAP ALONE!

Convair, San Diego, does so. The secret? It lies in ordering extrusions in lengths more closely suited to production requirements: the mill makes no charge for cutting if the order exceeds 100 lbs. Scrap ends can be reduced from feet to inches by proper planning.

You can plan on big savings, too, if you make a habit out of reading your 1955 PRODUCTION PLANBOOK issue of *American Machinist*. Hundreds of case histories like the one listed above are found in the "nugget" sections of this issue.

Mine this rich vein of information now. Read it thoroughly and keep it handy for regular reference.

American Machinist
McGraw-Hill Building, New York 36, N. Y.

Who's handling public relations for you behind the Iron Curtain?

It's not an easy assignment—or the kind you'll find many people volunteering for.

But there *is* an important "public relations" job to be done behind the Iron Curtain—for you . . . for America . . . for the whole concept of freedom, free enterprise and individual rights. This job is an opportunity and a challenge as well as a serious responsibility for American business. Fortunately, with your help, there *is* an agency that can do the job—*Crusade for Freedom,* which supports Radio Free Europe and Free Europe Press.

Both these powerful, privately operated organizations continually challenge the barrage of Communist misstatements and false truths. Using saturation radio broadcasts and mass newspaper drops from message balloons, Radio Free Europe and Free Europe Press are constantly on the offensive against the Red campaign to annihilate right, reason and national pride.

Continued and heated Communist protests testify to the tremendous effectiveness of Radio Free Europe and Free Europe Press. Support freely given by free American business and private citizens will increase this effectiveness and the scope of their operations. A contribution now is perhaps the best investment you can make towards a peaceful, prosperous world.

Give generously. It's your future!

Check list for business executives in the Crusade for Freedom

- ☐ Order display material for your company bulletin board.
- ☐ Plan a paycheck stuffer to fully acquaint your employees with the importance of the Crusade for Freedom.
- ☐ Plan to conduct an in-company solicitation.
- ☐ Match employee funds with *your Truth Dollars.*

PUBLIC SERVICE ADVERTISING COUNCIL

For campaign material and information write **CRUSADE FOR FREEDOM,** 345 East 46th St., N. Y. C. 17.

EMPLOYMENT OPPORTUNITIES

With Sundstrand Magnetic Chucks

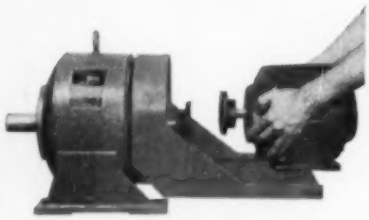
Here's how Caterpillar Tractor Co. uses Sundstrand magnetic chucks to eliminate fixtures and cut down set-up time. A pair of chucks are used as a permanent set-up for milling the bell end flange on 26 different oil pans. Prior to installation of the Sundstrand chucks, their pans required 7 different fixtures and from ½ to 1½ hours set-up time. With magnetic chucks, a throw of a switch will secure or release either or both pans instantly. If you have milling or grinding operations in your plant it will pay you to investigate Sundstrand magnetic chucks.

Free Data Write for this new magnetic chuck bulletin — contains useful information on the complete line of Sundstrand Power-Grip Chucks. Ask for bulletin **154-M.**

SUNDSTRAND POWER-GRIP

SUNDSTRAND
Magnetic Products Co.
Division of Sundstrand Machine Tool Co.
1020-9th ST. • ROCKFORD, ILLINOIS

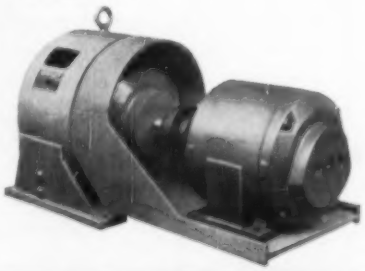
Change MOTORS ...in Minutes



...with the Phillie Gear UTILITY GEARMOTOR

Motors can be interchanged or replaced in a matter of minutes, merely by unbolting the old motor, separating the coupling halves, and bolting-on the new motor. No long and costly "down-time". Replacement of standard foot mounted motors is not limited to the original make of motor.

The Philadelphia "Utility" Gearmotor is of heavy, non-corrosive cast iron construction. The rugged design of the motor support eliminates alignment and vibration problems between reducer and motor. These Units are available with motors up to 60 h.p., in full range of AGMA output speeds—they can be furnished from stock for prompt delivery, either with or without motors. The "Utility" Gearmotor is equipped with the patented and widely used Philadelphia "Sphereflex" Flexible Coupling, which provides additional versatility of mounting. Send for complete Gearmotor Catalog, and be convinced.



PHILADELPHIA GEAR WORKS
INCORPORATED
ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.
BALTIMORE • CLEVELAND
Virginia Gear & Machine Corp., Lynchburg, Va.
Industrial Gears & Speed Reducers • LimTorque Valve Controls

CAN WE HELP?

American Machinist's Reader Service Department handles thousands of requests for additional information on advertised products, article reprints, and other assistance or service our readers want. Whenever, we can be helpful to you . . . write to:

Manager, American Machinist Reader Service
330 W. 42nd Street, New York 36, N. Y.

Opportunity...

TO WORK WHERE IT'S FUN TO LIVE

Can You Qualify?

- **Electronics Technician or Engineer**
- **Design, Development and Research Engineer (Aircraft—Mechanical—Electrical)**
- **Physicist**
- **Draftsman**
- **Precision Production Machinist**
- **Precision Machine Operator**
- **Experimental Machinist**
- **Aircraft Sheet Metal Worker**

Here is what you should do:

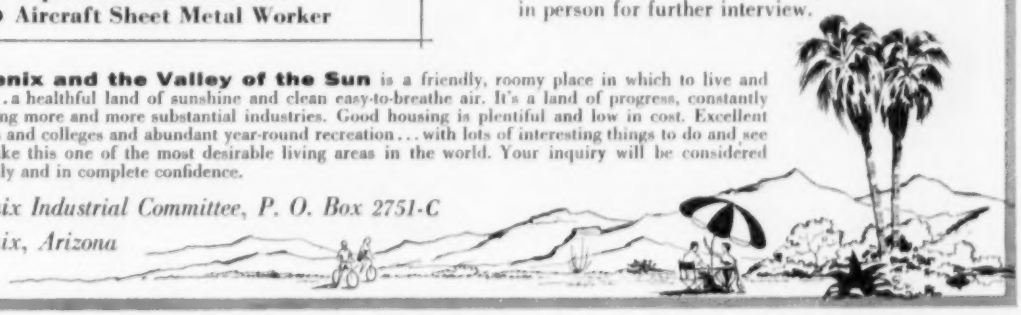
✓ Analyze your own qualifications carefully.

✓ Send a summary of your qualifications and experience. State when you are available.

✓ Do not come to Phoenix without first writing. Job opportunities are mainly restricted to specialists listed here. If your summary qualifies you for consideration you will be contacted by mail, phone or in person for further interview.

Phoenix and the Valley of the Sun is a friendly, roomy place in which to live and work...a healthful land of sunshine and clean easy-to-breathe air. It's a land of progress, constantly attracting more and more substantial industries. Good housing is plentiful and low in cost. Excellent schools and colleges and abundant year-round recreation...with lots of interesting things to do and see ...make this one of the most desirable living areas in the world. Your inquiry will be considered promptly and in complete confidence.

Phoenix Industrial Committee, P. O. Box 2751-C
Phoenix, Arizona



PRESIDENT

$30,000 - $40,000

Our company is a rapidly growing manufacturer of industrial machinery, financially sound, profitable and in an excellent competitive position.

We have an outstanding opportunity for a strong administrator who, as chief executive officer, will direct all corporate activities for our continued rapid growth.

- Experience as General Manager or as manager of Manufacturing or Engineering, preferably in process machinery, machine tools or related industries.
- Preferred age 40 to 50 years.

This position offers an opportunity for growth and an excellent working relationship with the directors, who are long established in the community.

Your reply may be brief and will be treated in confidence. It should include age, present connection and home telephone number.

P-9576, AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.

Machine Designers
Draftsmen

• Promotions within our company have created a number of opportunities for qualified men to grow with our growing engineering organization.

If you'd like a career with a real future, with a long established company that's widely known as a good place to work, write or visit us now!

Write:* C. T. Blake, *Mgr.
Engineering Department

WARNER & SWASEY CO.
5701 Carnegie Avenue • Cleveland 3, Ohio

Additional Employment Advertising on page 352

Gaging . . .

the Surplus Machinery Market

"Business has been quieter in the last three weeks or so" is the report from dealers in widely scattered sections of the country.

But it's not for lack of buyers. The big trouble everywhere is getting hold of good-quality general-purpose machine tools for resale. And when the dealer does get hold of a good machine, he has to pay so much for it from price-wise sellers that his profit margin is cut badly.

The dealer is currently caught in the middle — between the sellers and buyers of used machinery, who just can't seem to understand the tremendous difference resalewise between, say, a 1953 milling machine and a 1943 model of the same thing.

The seller can't, or won't, realize that a 1953 model has much more complex equipment built into it. So when the dealer comes around to buy his 1943 job, he sets the price sky high — figuring a milling machine is a milling machine, and what difference does 10 years make? On the other side of the coin, the man who buys from the dealer can't see why the 1953 model costs so much more.

It seems to be a universal problem. But one firm has gotten around this hurdle by showing the customer a set of films and diagrams that show the structural changes in a machine from model to model.

Here's a coast-to-coast rundown of the market:

EAST: business generally has slacked off slightly in the last two or three weeks, but it's still far, far ahead of last year. One of the biggest dealers says "A year ago, business was dead; we're running at least 50% ahead." Another estimates sales are 20-25% ahead of a year ago, 10-15% ahead of six months ago. Both estimate that business will hold up through the rest of the year, taking into account seasonal slackoffs. Contract rebuilding is doing well, with the big rebuilders' crews on a full 40-hr week. They could easily go into overtime but are trying to avoid it because overtime pay cuts heavily into already small profit margins. Eastern best sellers: all types of first-line lathes and radial drills. Milling machines and horizontal and vertical boring mills are in good demand, so are big grinders. There are plenty of buyers around for the big stuff, like 100-in. mills, and 4- and 6-in. horizontal boring mills, but just try to get hold of one!

MIDWEST: Chicago-area dealers are still mad about the out-of-all-proportion prices bid for used machines by users at the recent Liquid Carbonic auction. Dealers were completely squeezed out. Sales out here are running a good 50% ahead of a year ago, and the trouble is in keeping good stocks. Good used machine tools are tough to come by out here, too. Top Chicago demand is for radials, turret lathes, column drills. Small demand for specials and semi-specials because of retooling costs. Michigan dealers suffered a 30% sales drop in recent weeks, but this may pick up because the auto picture is rosier than it was. Detroit-area auctions have been "sloppy" — poor equipment, high prices.

WEST COAST: Los Angeles area is booming, with firms in that region taking 70% to 90% of dealers' stocks. Dealers say trade-ins are becoming an increasingly important factor, anywhere from 10-30% of all deals. Best sellers on the West Coast today: lathes, punch presses, milling machines, horizontal boring mills — mainly for replacement purposes.

SEARCHLIGHT SECTION
(Classified Advertising)

BUSINESS OPPORTUNITIES

EQUIPMENT - USED or RESALE

UNDISPLAYED RATE

(Not available for equipment advertising)
$1.50 a line, minimum 3 lines.
Box Numbers—Count as one line.
Discount of 10% if full payment is made in advance for 4 consecutive insertions.

DISPLAYED RATE

The advertising rate is $14.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

Send new advertisements to
AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.
for April 23rd issue closing April 9th.

HIGH-GRADE TOOLS

No. 5 GISHOLT Turret Lathe '44
1H5 LIBBY Turret Lathe '42
4H12 LIBBY 12" spindle Turret Lathe '42
No. 2 BARDONS & OLIVER Turret Lathe '40
No. 73 HEALD Plain Internal Centerless Grinder '43
4"x12" LANDIS Type H Hydraulic Plain Grinder '40
16"x36" NORTON Type C Hydraulic Plain Grinder, plunge, '42
No. 34-36 CINCINNATI Hydromatic Form Grinder '43
TG-613 JONES & LAMSON Thread Grinder '43
LT-6x36 LEES-BRADNER Thread Miller '43
HT-12x54 LEES-BRADNER Thread Miller '43
HT-12x102 LEES-BRADNER Thread Miller '43
14"x6' SPRINGFIELD Timken Grd. Hd. Lathe '42
No. 33-VP-1848 SUNDSTRAND Fluid Screw Vertical Miller '41
No. 33 STOKER UNIT Production Miller '44
32" OHIO Heavy V-ram Shaper '43
AUTOMATIC Double Spindle Profiler '41
No. 48-A HEALD "Bore-Matic" Boring Machine '40
A-4 ROBINSON 56-ton OBI Press, new
No. 3-20 FOOTE-BURT Vert. Hydr. Duplex Surface Broaches '50

Many other tools in stock
Send for stock list

COX MACHINERY CO., INC.
JUniper 1-3091, P.O. Box 1953
Cincinnati 1, Ohio

MOTORS · GENERATORS
TRANSFORMERS
NEW · REBUILT
WORLD'S LARGEST INVENTORY
ELECTRIC EQUIPMENT CO.

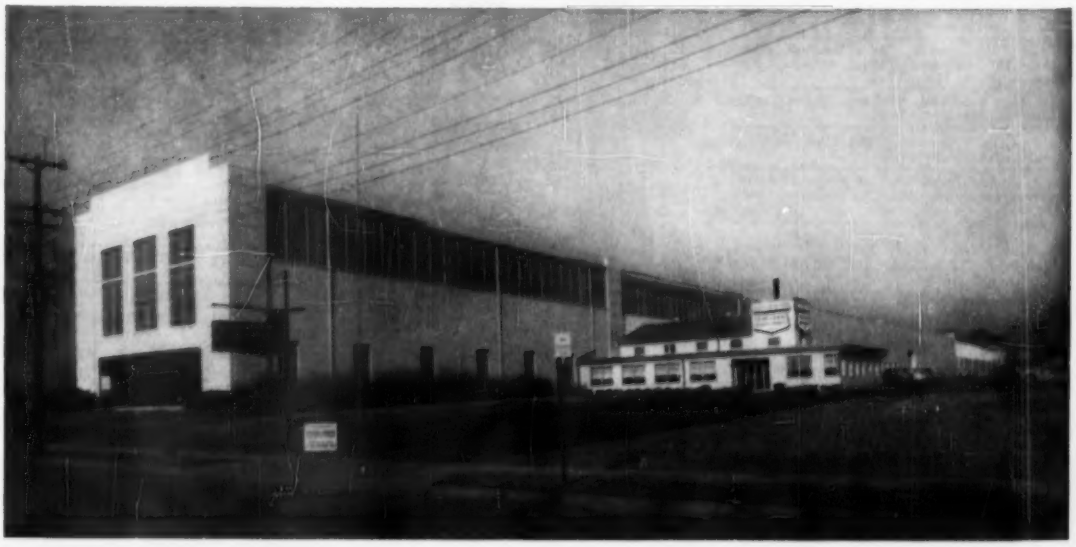
MACHINERY WANTED

1 Reishauer Gear Grinding Machine. Must be in excellent working order. Advise serial number, age and price. We are user.

W1135 AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.

Eastern Rebuilt Machine Tools

THE SIGN OF QUALITY — THE MARK OF DEPENDABILITY



HONING MACHINES

No. 182 Barnesdrill Hone, m.d.
No. 854 Micromatic Vertical Honing Machine, m.d.
H1 Micromatic Horizontal Hydrohoner, m.d.
H4 Micromatic Horizontal Hydrohoner, m.d.
No. 6 Barnes Twin Spindle
No. 306H Barnes Single Spindle
No. 224B Barnes Honing Machine, m.d.

THREAD GRINDERS

No. 33 Excello, m.d.

INTERNAL GRINDERS

No. 5 Bryant, m.d., latest
Model 5Y Bryant, m.d.
No. 16—16" Bryant, m.d., hydraulic Hole Grinder
No. 16CR16 Bryant, m.d., latest
No. 16—22" Bryant, m.d., latest
No. 16—38" Bryant, m.d., latest
No. 16-A-28" Bryant, m.d.
No. 24-36 Bryant Hole & Face Type, m.d., late
No. 24P—26" Bryant, m.d.
No. 24—21" Bryant, m.d.
No. 24-L-36 Bryant, m.d., late
No. 24-LW-36 Bryant, m.d., late
No. 44 Heald Facing Type Borematic, m.d.
No. 47A Heald Borematic, m.d.
No. 649—16" Van Norman Automatic Oscillating Radius, m.d., latest
No. 70A Heald, m.d., latest
No. 72 Heald Sizematic, m.d.
No. 72A Heald Sizematic, "Duplex", m.d.
No. 72A Heald Gagematic, m.d.
No. 72A3 Heald Gagematic, m.d.
No. 72A3 Heald Sizematic, m.d.
No. 72A5 Heald Sizematic, m.d.
No. 72A5 Heald Plain, m.d.
No. 73 Heald Airplane, m.d., latest, new
No. 74 Heald, m.d.
No. 74 Heald, Plain Long Base, m.d., 1941
No. 75A Heald, m.d., latest
No. 78 Heald Centerless Cylinder Grinder, m.d.
No. 81 Heald Gagematic, Sizematic, m.d.
No. 81 Heald Plain & Sizematic, m.d.

PUNCHES & SHEARS

No. 2 Hilles & Jones Horizontal Punch, m.d.
No. 7 Thomas Vertical, latest
No. 6½ Hilles & Jones Punch & Shear, single end, type C
Cleveland Shear, 72" gap, 18" blade, 1" plate
Cleveland Type G Vertical Punch, 72" throat, m.d.
Wiedemann R7 Turret Punch

SURFACE GRINDERS

No. 2B Brown & Sharpe, m.d.
No. 33 Abrasive, m.d.
14" Pratt & Whitney Vertical, m.d.
No. A-1-8" Arter Surface Grinder
No. 22—12" Heald Rotary, m.d.
#23A—24" Heald Rotary, m.d.
No. 2 Brown & Sharpe, m.d.
Model 84 Bridgeport Face Grinder
#300-60 Hanchett Vertical Spindle Surface Grinder
Model 4-C Thompson Hydraulic Surface Grinder, m.d.

DISC GRINDERS

No. 230 Gardner Double End, belted m.d.
No. 151 Besly, m.d.
Hammond Disc Grinder, Model No. 600
Model V10 Hammond Belt Sander, m.d.
No. 4 Gardner Disc Grinder, m.d.
7½ H.P. U.S. Elec. Tool Co. Disc Grinder, m.d., new
14A Gardner Grinder, m.d.
No. 186—36" cap. Gardner, m.d., latest type
No. 121 Hanchett Prod. Face Grinder, m.d.
No. 220 Hanchett Opposed Disc Grinder, m.d.

PLAIN CYLINDRICAL GRINDERS

No. 5 Brown & Sharpe Plain Cylindrical, m.d., 1942
6x15" Cincinnati Plain Hydraulic, m.d.
6x18" Cincinnati Model EA, m.d.
6x18" Cincinnati Model ER, Plain Hydraulic, m.d., Filmatic Spindle
6x18" Landis Type C Hydraulic, m.d., late
10x18" Cincinnati Plain Hydraulic, Model ER, m.d., Filmatic Spindle, 1943
10x18" Cincinnati Model EA, m.d.
10x18" Norton Type C, m.d., latest
10x36" Cincinnati Hydraulic, m.d.
10x36" Norton Type C, m.d.
10x72" Landis, m.d.
10x72" Norton, motorized
12x36" Landis Plain Self-Contained, m.d.
12x96" Landis Plain Self-Contained, m.d.
14x36" Landis Plain Hydraulic, m.d.
14x52" Norton, motorized
16x72" Landis Plain, m.d.
16"x72" centers Type C Norton Semi-Auto., Hydraulic
16"x96" Cincinnati Plain Cylindrical, m.d.
16" raised to 20" size x 72" centers Norton, Type C, m.d.
18x72" Norton Type C, mechanical, m.d.
20x120" Landis Plain Self-Contained, m.d.

UNIVERSAL GRINDERS

10x24" Landis Type C, m.d.
12x48" Norton Universal, m.d., latest
14x48" Landis Universal
14x72" Cincinnati Model ER, m.d., latest type, Filmatic Spindle
18x66" Landis Universal, m.d., Type C

SEND FOR COMPLETE STOCK LIST

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio
MElrose 1241
CABLE ADDRESS
EMCO

BUY FROM STOCK Telephone BAKER 5887

FALK MACHINERY COMPANY

10 WARD ST. ROCHESTER 5 N. Y.

Every Item Guaranteed as Represented

LATHES

4 DE POTTER & JOHNSON Automatic Turret Lathe, Late Type.

27"x18' MONARCH "N" Geared Head Lathe, 11' centers, Taper Attach., Full Equipment, Late Type, 1942.

24", 36" BULLARD Vertical Turret Lathe, Turret Hd. Side Hd., M.D.

No. 2, 4, 6, #2A WARNER & SWASEY Univ. Turret Lathes, Bar Feed.

No. 2, 7 BARDONS & OLIVER Universal Turret Lathes, Preselector, Bar & Chucking. Late Type.

DRILLING MACHINES

6 Spindle No. 2 LMS LELAND-GIFFORD Drill Press. Late Type.

No. 2 M. T. Six Spindle ALLEN Type KH Drill Press, Individual Motor Drive, Late Type.

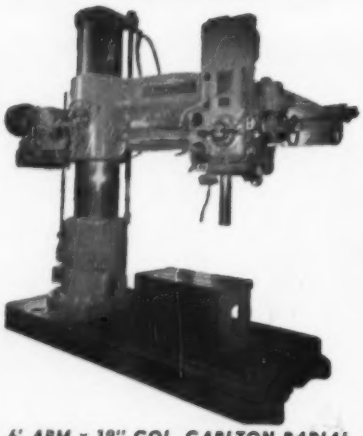
#2 CINCINNATI Universal Mill, Dial Type, Vertical Head, Late Type.

No. 2 BROWN & SHARPE Vert. Mill, Light Type, Swivel Head, M.D., Late.

No. 2B BROWN & SHARPE Horizontal Mill. Motor in Base. Late Type.

1A PRATT & WHITNEY Jig Borer, with Gauges, rods, Collets and Chuck.

4' x 11" CARLTON Radial Drill. Motor on arm. Late Type.



6' ARM x 19" COL. CARLTON RADIAL DRILL, 20 HP., LATE TYPE, 1943

No. 18 MARVEL Hydraulic Roll Stroke Power Hack Saw, 18" x 18" cap., M.D.

No. 91-C TOLEDO Straight Side Double Crank Power Press, 27"x36" Bed Area, 60 tons cap., M.D.

No. 8 BLISS CONSOLIDATED 90 tons cap. O.B.I. Geared, Air Cushion. M.D.

400 tons CHAMBERSBURG Hydraulic Wheel Press, 14" Ram, 96" between Tie Bars, 12' to End Support. M.D.

No. 1, 2 BUFFALO FORGE Vertical Angle Beading Rolls, M.D.

42 tons C-14 FERRACUTE O.B.I. Press 4½" stroke. New 1946.

½, 1½ BUFFALO FORGE Universal Ironworker, Notcher and Coper, M.D.

No. 8LS FELLOWS M.D. Gear Lapping Machine. Detachable Head, Univ. Work Support.

No. 00G BROWN & SHARPE High Speed Automatic Screw Machine. M.D. Late type.

10' x ¼" WYSONG & MILES Power Squaring Shears, Motor Driven.

GRINDERS

4"x12" LANDIS Hydraulic Plain Cylindrical Grinder, M.D., Late Type

6"x18" NORTON Hydraulic Horizontal Surface Grinder, Permanent Magnetic Chuck, Coolant System, Late Type.

No. 14 WD HAMMOND Double End Carbide Grinder, M.D.

6" x 10" x 48" NORTON Hyd. Horiz. Surf. Grinder, M.D.

4T SELLERS TOOL GRINDER, M.D., Late Type.

30" INGERSOLL Face Mill Cutter Grinder, M.D. Late Type.

6" x 18" LANDIS Type "C" M.D. Hyd. Cylindrical Grinder, Serial #29196.

No. 208 BESLEY Motor Driven Disc Grinder. 26" wheels, Late Type.

No. 194 BARNES Vertical Hone, 4" capacity, 12" stroke, Motor Driven.

15'x10'x36' BETTS double housing Planer, 4 swivel heads tandant control box table Motor Drives.

OVER 1000 MACHINE TOOLS AVAILABLE IN STOCK . . . SEND US YOUR INQUIRIES

HILL-CLARKE

BEST BUY OF THE MONTH

42" Swing x 72" Centers. NORTON TYPE C CYLINDRICAL GRINDER, 16" Extra Heavy Frame, 20 HP wheel motor, power rapid traverse, also extra equipment Ser. C-22459, New in 1947. Replacement cost $40,000. OUR PRICE $17,500.

PARTIAL LISTING

BORING MACHINES

Foote-Burt Vert. 26" sw, new 1941
36" Bullard VTL, side hd, 1941
#49 Heald Borematic, new 1944

DRILLS

1 spdl, 14" sw, #2 Avey, new 1940
1 spdl, 24" sw, #2MA6 Avey, new 1942
1 spdl, 26" sw, #5MS L-G, hydraulic
2 spdl, 24" sw, #3 Avey, AC MD
3 spdl, 20" sw, #2LMS L-G, 1942
3 spdl, 24" sw, #3MS L-G, new 1943
3 spdl, 24" sw, #2MS Allen, 1942
4 spdl, 14" sw, #2LMS L-G, new 1942
4 spdl, 26" sw, #2LMS L-G, new 1944
6 spdl, 20" sw, #1LMS L-G, new 1943
6 spdl, 26" sw, #2LMS L-G, new 1943
#314-A Baker Unit H.D., 1943
16 spdl, Fox S.R.80ff, #2 taper, 1944

BORING MACHINES

100" N-B-P, 2 swivel hds, DC MD
Foote-Burt Vert. 26" sw, new 1941
36" Bullard VTL, side hd, 1941
#40 Heald Borematic, new 1944

GRINDERS

6"x18" Norton Type C, new 1943
10"x18" Norton Type C, new 1943
10"x30" Norton Type C, new 1942
10"x48" Norton Type C, new 1943
10"x72" Hill-Clarke, AC Mot. Dr.
10"x96" Hill-Clarke, AC Mot. Dr.
10"-20"x36" Norton, angular wheel
14"x48" Landis Type C, new 1941
16"x72" Hill-Clarke, AC Mot. Dr.
16"-36"x72" Norton, AC MD, 1941
42"x72" Norton, extras, new 1947
18"x96" Hill-Clarke, AC Mot. Dr.
18"x120" Norton Plain Cyl.
20"x192" Norton, AC Mot. Dr.
24"x84" Van Norman C.B., 1951
24"x264" Norton, AC MD, Rebuilt
26"-32" Gap x 114" Norton Pl. Cyl.
14"x18" Landis Type C Univ. chuck
#5A Bryant Internal, new 1943
#16A-16 Bryant Internal, new 1943
#16-36 Bryant Internal, new 1941
#24-26 Bryant Internal, new 1941
#24-36 Bryant Internal, new 1941
#72A5 Heald Internal, new 1942
#72A5 Heald Bridge Type Int.
#214 Besly Double End Disc, 1940

LATHES

16ML-16"x36" LeBlond Auto.
#16ML-16 LeBlond, Semi-Auto, 36" cc
14"x36" Amer. Grd. Hd., MD
27"x84" Amer. Grd. Hd., MD
36"x126" Putnam Grd. Hd., MD
R14 Seneca Falls, 16"x36", 1942
120"x96' cc N-B-P, ser. 2380
#5W Cinn Acme Univ. Turret
#5AL Gisholt, cross-slide Tur. 1941
#3H-10 Libby H.D. Tur. 1942
#4A W&S Turret, new 1944
4FU Fastermatic, tur. 32" sw, 1944
#8D Potter & Johnston, new 1941

MILLERS

54"x30"x16 Ingersoll Slab, 1934
54"x8' Ingersoll Openside, 1942
54" Ingersoll Vertical
16"x60" P&W Mod. B Thread Mill
#CT L-B Thread Mill, new 1942
#08 Cinn. Vert. back lash, 1942
#36 Van Norman, Rebuilt, 1941
#1-18 Van Norman Prod. 1942

PLANERS

36"x36"x12' Rockford Openside '42
60"x48"x27' American, 4 hds.
60"x48"x30' Hamilton, 4 heads

MISCELLANEOUS

#3L La Pointe 15T Horiz. Broach
6" Goss & DeLeeuw, 8 spdls, 1941
#306 Barnes Vert. Hone, new 1942
15 Ton Hyd. American Press, 1946
#11RD 2 Hd: W&S Tapper, Intest
#12HS G&E, 12" cap. Gr. Hobber
#36HM G&E 3 Spdl. Bevel Gr.
#61A Fellows Gr Shaper, 16" cap.
#5A Kaufman Pneu. Tapper, 1947
#HHS Barber-Colman Sharp. Mach.
16 ga. 42" Economy Power Shear
15 T Toledo Overhead Crane, 39½'

HILL-CLARKE MACHINERY COMPANY 651 WASHINGTON BLVD., CHICAGO 6, ILL.

PHONE: CEntral 6-0500

BENNETT MACHINERY CO.

GUARANTEED MACHINE TOOLS

BORING MILLS 4½" bar Sellers, Floor Type
3½" bar Gilbert, Floor, 1943
4" & 3½" Bar Landis, Floor Type (2)
3" Bar Universal Thle. Type, Triway
GRINDERS, 12"x48" & 16"x96" Landis, Late (2)
60" Hanchett Vert. Spin., No. 300 Hyd., Surf.
Nos. 2B Reid, 3B Abrasive, Surf.
36"x42" Pratt & Whitney Die & Surf.
30"x120" Hanchett Plane, Surf.
16"x96" Cinci. Plain Cyl.
LATHES, 25"x192" Cen. L. & S., T.A., Late
14"-16½"x78" Cen. Monarch, T.A.
20"x54" con. Reed Prentice '43
TURRET, No. 2H10 Libby 10¼", '43
MILLER, 268U Van Norman, '42
SHAPER—32" Cinci., '41; 24" Cinci. Univ., '40
SHAPER, VERT., 12" Pratt & Whitney, 1942
SLOTTER, 36" Rockford, Hyd., '44

375 Allwood Rd., Clifton, New Jersey
Phone: PRescott 9-6700 N. Y. Phone: LOngacre 3-1777

Indianapolis MACHINERY & SUPPLY CO.

1983 South Meridian Street
Indianapolis 6, Indiana

- SBD 72-30 American Duplex Vertical Broach 30-ton 72" stroke. 1943.
- 36" x 240" Centers Niles Timesaver Engine Lathe. New in 1941.

Write for Complete Stock List

LATE TYPE MACHINE TOOLS

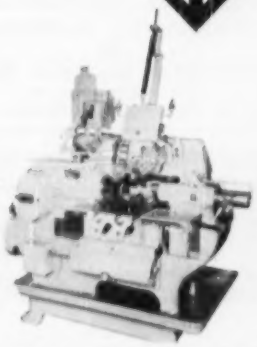
10—Fellows Straight Line Gear Generators with rack type cutter. Serials 17960 to 22694. Attractive price for the lot.

D. E. DONY MACHINERY CO.
4357 St. Paul Blvd., Rochester 17, N. Y.

LOOKS LIKE NEW . . . PERFORMS LIKE NEW
BUT YOU CAN BUY IT FOR LESS THAN HALF THE ORIGINAL PRICE! AND GET IT NOW!

PARTIAL LISTING—SEND FOR CATALOG OF 1000 MACHINE TOOLS

7" No. 76H Baird Chucker, new 1943.
Engravers, Models BL 2416 & B13616 (7)
Pratt & Whitney Kellering machines
No. 20-60 Oilgear dual ram surface broach, 1940.
No. 56 Sundstrand centering machine.
24" No. 314 Baker Brother H. D. Drill.
9' Arm 16" Column American Radial Drill.
16 Spdl No. D20H Natco multiple drill, 1943.
36" No. 36H Gould & Eberhardt gear hobber.
No. 2 Cincinnati filmatic bearing centerless grinder.
4" x 12" No. 4H Landis plain hyd. cylindrical grinder, 1943.
6" x 30" Cincinnati plain hyd. cylindrical grinder, 1942.
13" x 60" Hanchett vert. spdl. surface grinder, late.
8" x 24" Norton horiz. spdl. surface grinder.
14" x 46" Hendey toolroom lathe, new 1940.
24" x 8' Bed LeBlond H. D. Engine lathe.
36" x 156" cc. Monarch "NN" engine lathe, new 1942.
126" x 96 ft. cc. Niles Bement Pond engine lathe.
Model 10 Sundstrand automatic lathe, late.
15" x 30" Lipe Carbo-Matic production lathe, 1942.
Model M-24 Kearney & Trecker simplex mill, 1943.
No. 2-20 Kent Owens mfg mill, hydraulic, 1941.
36" Rockford hydraulic openside shaper-planer.
36" Rockford hydraulic vertical slotter, new 1944.



Model 10 Sundstrand Automatic Lathe with Timken Bearing spindle Cycle type machine with hardened ways. Rebuilt and guaranteed new condition, immediate delivery.

WHEN YOU THINK OF MACHINERY, THINK OF

MILES MACHINERY COMPANY

2039 E. GENESEE AVE. PHONE 2-3105 SAGINAW 1, MICH.

MACHINE SHOP. So. Texas. Gd. profits. Little competition. Xlnt. reputation. Establ. 1931. Compl. equip. R.E. opt. Priced low. Dept.' #7238.

STEEL FABRICATION CO. Impt. Oregon city. In heart of rich logging area. Netted $49,170 last yr. Handles steel work, shop welding, outside work & mfgrs. log forks, etc. Does custom work. Over $90,000 in 1956 in custom contracts alone! All land & bldgs. included. Complete equipment. Potentialities unlimited to right buyer. For further information, write Ford, Dept. #22993.

FREE BULLETINS ON ABOVE BUSINESSES

CHAS. FORD & ASSOC.
6425 Hollywood Blvd., Los Angeles, Cal.

87 Walton St., Atlanta, Ga.

OFFERED FOR SALE

MACHINE TOOL MANUFACTURERS OF TURRET RAM TYPE VERTICAL MILLER MACHINE

We will sell patterns, jigs, fixtures, prints and all rights to manufacture our line of millers. Our line is well established throughout the United States by a great number of active dealers supplying more orders than we can take care of at present.

We find ourselves in the position to greatly expand our facilities or to sell out this machine line we manufacture.

FS-8297, AMERICAN MACHINIST
330 W. 42nd St., New York 36, N. Y.

ELECTRIC FURNACES TO 1850F
with Auto Temp Control. Sliding door, heavily insulated, substantial, accurate, dependable for machine shop, tool room, laboratory New
8"x12"x15" Inside 4.5 K.W. $300.00
12"x16"x20" Inside 9.0 K.W. $500.00

E. H. WILLIAMS
BOX 9042A, HUNTINGTON, W. VA.

HERE ARE 4 MACHINES
PRACTICALLY NEW
BUILT IN 1954

SAFAK PLANER — 48"x36"x13' vari-voltage drive, power rapid traverse.

CORNAC Horizontal Boring Mill — 3½" bar.

DEUTSCHE NILES 41"-51" Vertical Boring Mill.

HURE #74 Universal Miller 66"x13¼" table.

REPLACEMENT COST — $350,000

A change in procedure requires that we dispose of these fine machines . . . an opportunity for you to get them at bargain prices.

Photographs & descriptive matter available.
Inspection under power invited.

J. M. LEHMANN COMPANY, INC.
550 New York Ave., Contact Don Ferrari, Lyndhurst, N. J.
Telephone: WEbster 9-7890

WORLD'S LARGEST STOCK

PRESSES

JOSEPH HYMAN & SONS
TIOGA, LIVINGSTON & ALMOND STS.
PHILADELPHIA 34, PA. GARFIELD 3-8700

SEARCHLIGHT SECTION

"Key to Preventive Maintenance"
MACHINE TOOL RECONDITIONING
& the Art of Hand Scraping (new 2nd printing) —useful for design, shop & inspection work— Write for folder describing illustrated book.
MACHINE TOOL PUBLICATIONS
215 Commerce Bldg., Fourth & Wabash Sts.
St. Paul 1, Minn.

PEACOCK CORPORATION
Propane Gas Installations
and
Anhydrous Ammonia Plants
Paul E. Peacock, Jr., Pres.
Box 268 Westfield, N. J. Westfield 2-6258

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us — we will take care of them
GENERAL PATTERN WORKS
7233 Rack Street Cincinnati, Ohio

REPLIES (Box No.) Address to office nearest you
NEW YORK: 330 W. 42 St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITION VACANT

Machine Shop Assistant needed by medium sized heavy process machinery manufacturer. Young college engineer graduate with some experience preferred. Position has a future. First duties will cover rate setting, carbide tool development and assist in increasing productivity. Company has liberal profit sharing plan. Salary open. Location S.E. Penna. Reply P-9590, American Machinist.

SELLING OPPORTUNITY OFFERED

Sales Representatives Wanted: Experienced in metalworking field. Positions open with established company now supplying hundreds of plants with semi-hydrogenated chemicals for drawing, forming, stamping, and cutting hard metals such as stainless steel, chrome nickel, and titanium. Wonderful opportunity for those who can qualify. Territories open in New England States, Southern States, and Midwest excluding Wisconsin and Michigan. Reply to RW-1134, American Machinist.

EMPLOYMENT SERVICE

Salaried Positions, $5,000 to $35,000. We offer the original personal employment service (established 46 years.) Procedure of highest ethical standard is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. R. W. Bixby, Inc., 552 Brisbane Bldg., Buffalo 3, N. Y.

POSITION WANTED

Supervisor: Production and quality control spot welding, age 33, sheet metal fabrication background. Can adapt similar field. Accustomed using initiative, assuming responsibility, ability handle men. PW-1259, American Machinist.

SPECIAL SERVICE

Time Study Equipment Time Study Boards with UCEZ transparent watch holders. Stop-watches —Pedometers—Slide rules, counters etc. Time study forms in stock. Write for free sample kit. O. P. Co., 5544 So. Homan, Chicago 29, Ill.

CONTRACT WORK WANTED

Canadian Machine Shop is interested in contacting American companies interested in having their equipment, assembled or built or sold in Canada. For more details please contact, Specialty Manufacturing and Distributing Company Ltd., 888 Dupont Street, Toronto, Canada.

Canadian manufacturer with machine shop, tool room, welding, press room and foundry and forging facilities available, interested in contacting American companies interested in having their equipment assembled or built or sold in Canada. For more details, please contact Bradley Machine Company Limited, 38 Clarence Street, Brantford, Ontario.

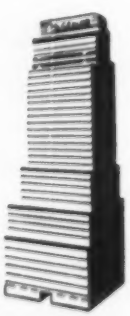
If Your Government Contract . . . .

. . . or Your Regular Product Requires MANUALS

Call in the McGraw-Hill Technical Writing Service

- OPERATION
- SERVICE
- OVERHAUL
- PARTS CATALOG
- TRAINING

Whether you need one or a set of manuals written and illustrated precisely to meet Government specifications or whether your products are such that instructions on their proper installation, operation, and service must be provided Technical Writing Service can do the job for you . . . efficiently . . . effectively . . . economically. Technical knowledge and writing skill are the keynotes of our service.



Write or Phone

TECHNICAL WRITING SERVICE
McGraw-Hill Book Company, Inc.
330 West 42nd Street
New York 36, New York

Tel: LOngacre 4-3000

INDEX OF PRODUCTS ADVERTISED IN THIS ISSUE

Abrasives ... 64, 294

Abrasives, Coated ... 30-31

Accessories & Attachments (Machine Tool) ... 34, 93, 100, 113, 218, 219, 240, 339, 342, 358

Arbors & Mandrels ... 299, 359

Bearings ... 4th Cover, 114, 319

Bending Machine ... 256B, 286-287

Books, Technical ... 246, 338

Boring, Drilling & Milling Machines (Horizontal) ... 14-15, 86-87, 192, 327, 356

Boring Machines Internal ... 2nd Cover

Boring & Turning Machines (Vertical) ... Insert facing 64

Broaching Machines ... 26-27, 170

Brushes ... 192D

Castings ... 316-317

Catalogs ... 250, 342

Centering Machines ... 356

Chucks ... 244, 299, 339 346

Cleaning & Drying Machines & Supplies ... 234, 336

Collets ... 299, 332, 339

Compressors, Air ... 312

Controls, Electrical ... 44-45, 49, 227, 278, 284

Coolant Systems, Filters & Supplies ... 42

Cut-Off Machines ... 110, 294, 300, 328, 336

Diamond Wheels ... 207

Die Sets ... 325

Dressers ... 257, 336

Drilling Machines ... 68-69, 73, 78-79, 89, 99, 102-103, 169, 176, 216-217, 235, 248-249, 262-263, 311, 318, 344

Drill Jig Bushings ... 97, 305

Duplicators & Pantographs ... 54-55, 232-233, 333-334

Electrical Parts & Equipment ... 44-45, 199, 227, 261, 284

Electro Erosion (Electric Discharge & Ultrasonics) ... 106

Fabricating Methods & Servies ... 294

Fasteners ... 3rd Cover, 72A, 172, 314, 329, 340, 342

Files, Hand ... 48, 213, 307

Forgings ... 315

Gages & Instruments ... 46, 77, 209, 225, 231, 237, 246, 250, 266, 272, 276, 282, 284, 290, 316, 331, 359

Gear Cutting Machines ... 3, 6-7, 20, 323, 342

Gears, Speed Reducer, Motor Reducers ... 230, 298, 323, 326, 330, 340, 346

Gear Testers ... 3, 6-7

Grinders—Cutter & Tool ... 242, 306, 332, 337

Grinding Machines—Production ... 4-5, 12-13, 16-17, 52, 63, Insert bet. 88-89, 335, 337, 358, 360

Grinding Wheels ... 18-19, Insert facing 32, 65, 74-75, 285, 301, 343

Heads: Drilling, Grinding & Tapping ... 270, 304, 311, 318

Heat Treating Equipment & Supplies ... 199, 223, 298

Honing Machines ... 108

Hydraulic & Pneumatic Parts & Equipment ... 273, 288, 297, 312

Jig Borers—176, Insert facing 224, 226, 251, 292, 306, 322

Jigs & Fixtures ... 294

Lathes, Automatic ... 54-55, 84-85, 112, 280-281

Lathes, Engine ... 32, 40-41, 48D, 59, 60-61, 62, 94-95, 102-103, 236, 258, 268, 321, 345, 357

Lathes, Turret ... 22-23, Insert facing 64, 84-85, 112

Lubricants, Cutting Fluids, Quenching Oils & Solvents 32B, 70-71, 101, 174, 197, 229, 245, 277, 295, 308

Lubricating Systems & Equipment ... 221, 303

Marking Machines, Tools, & Supplies ... 336

Materials, Cutting & Forming ... 58, 195, 211, 243, 259, 265, 320, 342

Materials of Manufacture ... 38, 39, 76, 82-83, 88, 90-91, 205, 209, 211, 215, 243, 244, 265, 298, 306, 309, 320, 332

Materials Handling Equipment ... 64B, 312, 330

Millers, Die Sinkers, Profilers ... 4-5, 8-9, 20-21, 48A, 292, 333, 334, 354

Motors, Electrical ... 36, 44-45, Insert bet. 48A-48D, 291, 313

Planers ... 232-233

Power Transmission ... 203, 207, 253, 319

Presses, Forging & Forming Equipment & Supplies ... 37, 66-67, 96, 104, 118, 220, 224, 238-239, 247, 254, 260, 270, 300, 302, 310, 315, 328, 336, 341, 355

Production, Inventory & Tool Control ... 255

Pumps, Circulating ... 258

Riveting Machines ... 354

Safety & Welfare Equipment ... 296, 330

Saw Blades ... 72D, 223, 289, 334

Sawing Machines ... 336

Screwdriving & Nut Running Machines ... 293

Screw Machines; Chucking Machines ... 35, 72, 81, 93, 112, 256

Shapers, Slotters, Keyseaters ... 120, 230, 232-233, 304, 344

Special Machine Tools ... 28-29, 54-55, 56-57, 68-69, 110, 201, 232-233, 235, 271, 283, 294, 304, 338

Spindles, Machine ... 336

Steel Blue ... 328

Swaging Machines ... 117

Tapping Attachments ... 339-340

Tapping Machines ... 68-69, 169, 318

Thread Cutting Machines ... 10-11, 328

Thread Rolling Machines & Tools ... 10-11

Tooling Set-up Equipment ... 34, 113

Tools, Cutting ... 24-25, 33, 43, 47, 50-51, 53, 58, 77, 98, 100, 170, 218-219, 224, 228, 246, Insert facing 256, 264, 269, 272, 274-275, 279, Insert bet. 288-289, 326, 342

Tools, Hand ... 241

Tools, Portable ... 63, 248-249

Transportation ... 224B

Used & Surplus Equipment ... 347-352

Vibration Control & Mountings ... 222

Vises ... 340

Welding & Cutting, Brazing & Soldering Equipment & Supplies ... 92, 192A, 244, 267, 324

Wipers, Industrial—Insert bet. 192A-192D

the MASERATI

SIZES 2 3 4

HORIZONTAL & VERTICAL

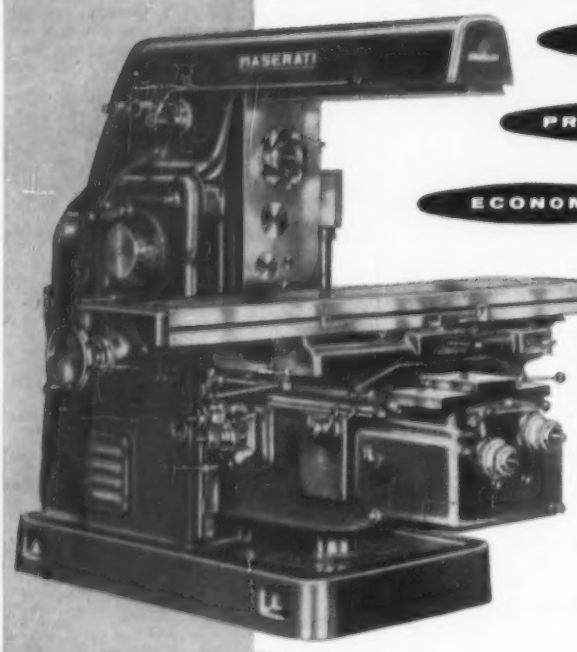
MILLING MACHINES

POWER

SPEED

PRECISION

ECONOMY



Manufactured by highly skilled specialists

- Power rapid traverses in all directions
- Wide range of speeds and feeds
- Dual automatic selection of speeds and feeds
- Dual controls for all power feeds and rapid traverses
- Dual controls for clutch and brake

COMPLETE INFORMATION AVAILABLE

Write for Detailed Specifications Today

Designed, built, tested, delivered and serviced by the same highly skilled specialists who design and build the famous Maserati Sports Cars.

MASERATI

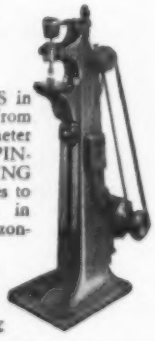
MASERATI CORPORATION OF AMERICA

WESTBURY, NEW YORK

GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method — Sizes to meet all needs — Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



THE GRANT MFG. & MACHINE CO.

85 Sillimon Ave., Bridgeport, Conn., U. S. A.

INDEX TO ADVERTISERS

This index is published as a convenience to the readers. Every care is taken to make it accurate, but AMERICAN MACHINIST assumes no responsibility for errors or omissions

	Page
Abbey Etna Company	117
Abrasive Products Inc.	74-75
Acromark Company	336
Alemite	303
Allen-Bradley Company	256
American Brass Company	309
American Chain Division, Inc. American Chain & Cable Company	64B, 237
American Gear & Mfg. Co.	230
American Optical Co.	296
American Screw Co.	329
American Sip Corporation	Insert facing 224
American Smelting & Refining Co.	265
American Steel Foundries, Elmes Engineering Div.	104
American Tool Works	73
Ames Company, B. C.	282
Anderson Oil Co, F. E.	101
Armstrong-Blum Mfg. Co.	72D
Armstrong Bros. Tool Co.	34
Atlantic Refining Company	308
Atlantic Screw Works Inc.	329
Baker Bros., Inc.	235
Barnes Drill Co.	271
Barnes Co., Inc., W. O.	264
Bay State Abrasive Products Co.	285
Behr-Manning Corp.	30-31
Benchmaster Manufacturing Co.	302
Besly-Welles Corp.	272
Bethlehem Steel Company	259
Bijur Lubricating Corporation	221
Bilgram Gear & Machine Company	330
Blake & Johnson Co.	329
Blake Co., Edward	332
Blanchard Machine Co.	52
Bliss Co., E.W.	37
Brush Electronics Company	331
Buffalo Forge Co.	341
Bullard Company	Insert facing 64
Butterfield Div. of Union Twist Drill Co.	53
Capewell Mfg. Co.	289
Carborundum Company	Insert facing 32, 298, 306, 332
Carlton Machine Tool Company	78-79
Carpenter Steel Company	215
Carroll & Jamieson Machine Tool Co.	258
Central Screw Co.	329
Century Electric Company	291
Chandler Tool Company	304
Chicago-Latrobe Company	252
Chisholm Moore Hoist Div. Columbus McKinnon Chain Corp.	330
Cincinnati-Bickford Tool Co. Sub. Giddings & Lewis Machine Tool Co.	89

INDEX TO ADVERTISERS

	Page
Cincinnati Gear Co.	246
Cincinnati Grinders Incorporated	16-17
Cincinnati Lathe & Tool Co.	102-103
Cincinnati Milling Machine Co.	4-5
Cincinnati Milling Machine Co. Grinding Wheels Division	65
Cincinnati Shaper Company	120
Cities Service Oil Co.	229
Clemson Bros., Inc.	334
Cleveland Automatic Machine Co.	81
Cleveland Crane & Engineering Co.	118
Cleveland Punch & Shear Works Company	247
Climax Molybdenum Co. of New York	211
Columbia-Geneva Steel Div.	82-83
Columbus Die-Tool & Machine Co.	294
Cone Automatic Machine Co.	35
Consolidated Machine Tool Corp.	59-62
Continental Screw Co.	329
Coulter Machine Co., James	328
Covel Manufacturing Company	337
Crescent Tool & Machine Co. Inc.	304
Cross Company	28-29
Crucible Steel Co. of America	76, 88
Curtis Pneumatic Machinery Div. Curtis Mfg. Co.	312
Davis Boring Tool Div. Giddings & Lewis Machine Tool Co.	33
Davis & Thompson Company	356
Davis Keyseater Company	344
Dearborn Gage Co.	266
Delta Power Tool Division Rockwell Mfg. Co.	262-263
De Vlieg Machine Company	292
Disston Division, Henry, H. K. Porter Co. Inc.	213
DoAll Company	209
Dodge Manufacturing Corporation	326
Dollinger Corporation	42
du Mont Corporation	98
Dykem Company	328
Eastern Machine Screw Corporation	270
Eastman Kodak Co. Industrial X-Ray	231
Elco Tool & Screw Corp.	329
Elmes Engineering Div., American Steel Foundries	104
Erickson Tool Company	339
Erie Foundry Company	315
Ettco Tool Company	318
Ex-Cell-O Corporation	97, 106
Farrel Birmingham Co., Inc.	323
Fawick Airflex Division Fawick Corporation	253
Federal Machine & Welder Company	310
Fellows Gear Shaper Company	6-7
Field Company Inc., William H.	242
Firth Sterling Inc.	320
Foote-Burt Company	169
Foote Gear Works, Brad	230
Ford Mfg. Co., M. A.	246
Fosdick Machine Tool Company	176

(Continued on page 356)

PRESS-RITE

Cuts "Per-Unit" Cost
Increases Die Life

3 Shifts a Day
Seven Days a Week
that's the year
'round schedule
at Tonka Toys

True-to-life truck bodies are made of 20 gauge steel drawn to a depth of 2¾ inches.

Chassis, cabs, wheels, etc., are turned out by thousands at Tonka Toys . . . and each one has to be *perfect* to pass the critical inspection of today's boys and girls.

Press-Rite Presses do the job better

Increased Die Life . . . the experience of Tonka Toys proves that Press-Rite's tie rod frame design gives rigidity that really pays off in reducing costly die wear. You get longer runs between die grinds and keep dies at peak efficiency.

Protects against "Double Headers" . . . The Press-Rite Airflex Clutch protects dies against accidental breakage as air-pressure is adjusted for-the-job and allows the clutch to slip on "double headers".

ALL-OUT PRODUCTION

at the TONKA TOYS Factory

Mound Metalcraft Company, the home of Tonka Toys, is now one of America's leading toy manufacturers. Their rapid growth is symbolized by their "repeat orders" year after year for additional Press-Rite Presses.

Press-Rite Presses and Airflex Clutches . . . that's the combination that the folks at Tonka Toys have found gives them the highest production . . . at the lowest cost per unit.

PRESS-RITE has many exclusive features to make it today's TOP PRESS VALUE. Send for Catalog Today—get the money-saving facts on the Press-Rite Line. Speed Production and Cut Costs in your plant.

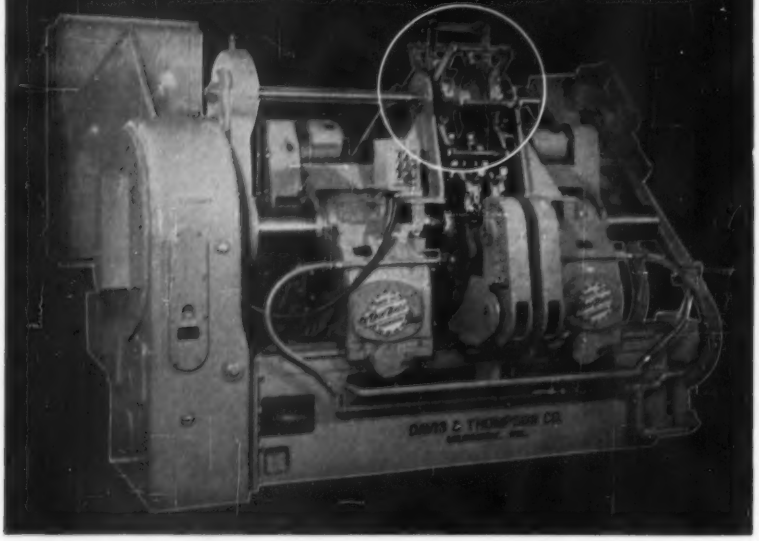
SALES SERVICE MACHINE TOOL CO.
2347 University Ave. St. Paul 14, Minn.

Write for Free Catalog and Name of Local Distributor

PRESS-RITE
OPEN BACK • INCLINABLE *Power Presses*

Used by more for More Production

. . . Milling and Centering Steering Gear Shafts at the Rate of 360 Per Hour



This continuous type milling and centering machine has been furnished with an automatic unloader (indicated by circle) which transfers finished parts onto a conveyor or discharge chute. Milling and centering of both ends is done simultaneously and in continuous production.

Basically, this is a standard ROTO-MATIC machine tooled-up to handle special production requirements. Rough and finish milling and centering spindles in both heads have micrometer endwise adjustment. Heads are adjustable on the ways. With equalizing jaws in fixtures plus chain clamping, machine is fully automatic.

If you have work of this nature, consult D&T engineering for further details.

Roto-Matic

Davis and Thompson Co.

4460 N. 124th St. Milwaukee 10, Wisconsin

Machining Stainless?

If you are . . . copies of *American Machinist's* 16-page Special Report . . . How to Machine and Finish Stainless Steel . . . are still available. Write to: Reader Service Department, 330 W. 42nd Street, New York 36. 25 cents per copy.

INDEX TO ADVERTISERS

(*Continued from page* 355)

	Page
Gallmeyer & Livingston Co.	360
General Electric Apparatus Dept. Insert bet. 48A-48D, 49	44-45
General Radio Company	284
Giddings & Lewis Machine Tool Company	14-15, 33, 89
Gisholt Machine Company	84-85
Gleason Works	3
Gorton Machine Co., George	333
Goss & DeLeeuw Machine Company	278
Grant Gear Works, Inc.	298
Grant Mfg. & Machine Company	354
Great Lakes Screw Corp.	329
Greenfield Tap & Die Corp. Insert facing	256
Greenlee Brothers	283
Hannifin Corp.	270, 297
Hardinge Brothers, Inc.	48D
Harnischfeger Corp.	92
Harper Co., H. M.	329
Hartford Special Machinery Co.	201
Haynes Stellite Co., Div. Union Carbide & Carbon Co.	243
Heald Machine Co. Sub. Cincinnati Milling Machine Co.	2nd Cover
Henry & Wright Div. Emhart Mfg. Co.	238-239
Hill Acme Company Acme Machine Division	335
Holo-Krome Screw Corporation	3rd Cover
Hones, Inc., Charles A.	298
Howell Electric Motor Co.	36
Ingersoll-Rand Co.	293
J & S Tool Company	257
Jergens Tool Specialty Company	342
Johnson & Bassett Inc.	334
Johnson & Son, Inc., S. C.	70-71
Johnson Machine & Press Corp.	260
Jones & Lamson Machine Company Insert bet. 72A-72D	
Kaiser Aluminum & Chemical Sales Inc.	90-91
Kearney & Trecker Corp.	20-21
Kenco Mfg. Co.	336
King Tester Corporation	250
Knight Machinery Co., W. B.	251
Korfund Company Inc.	222
Lamson & Sessions Co.	329
Landis Machine Company	10-11
Landis Tool Company	12-13
LaPointe Machine Tool Company	26-27
LaSalle Tool Inc.	240
LeBlond Machine Tool Co., R. K.	40-41
Lees-Bradner Company	80
Leland-Gifford Company	99
Levin & Sons Inc., Louis	344
Lincoln Electric Company	244
Linde Air Products Div. Union Carbide Corp.	192A
Link Aviation Inc.	46
Linley Brothers Co.	306
Lodge & Shipley Company	32
Logansport Machine Company, Inc.	273
Lucas Machine Division New Britain Machine Co.	86-87

INDEX TO ADVERTISERS

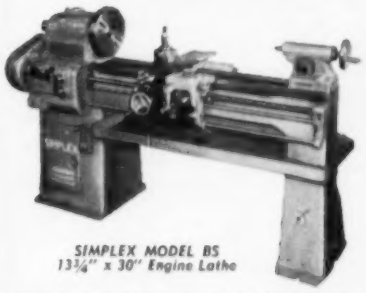
	Page
Macklin Company	343
Madison Industries, Inc.	274-275
Manheim Mfg. & Belting Company	203
Maserati Corporation	354
Matra-Worke GmbH	358
Mattison Machine Works	Insert bet. 88-89
M.B.I. Export & Import Ltd.	322, 340
McCaskey Industrial Div. Victor Adding Machine Company	255
McGraw-Hill Book Co., Inc.	338
Meehanite Metal Corp.	316-317
Metal Carbides Corp.	342
Michigan Drill Head Co.	311
Micromatic Hone Corp.	108
Mitts & Merrill	304
Modern Machine Tool Company	294
Mohawk Tools, Inc.	279
Moline Tool Company	338
Morey Machinery Co.	357
Morse Twist Drill & Machine Co.	24-25
Motch & Merryweather Machinery Company	110
National Acme Company	72, 93
National Automatic Tool Co., Inc.	68-69
National Broach & Machine Co.	170
National Lock Co.	329
National Machine Tool Company	230
National Screw & Mfg. Co.	329
National Tool Company	269
National Twist Drill & Tool Co.	51
New Britain Machine Company, The	86-87
New Departure Div.; General Motors Corporation	114
Niagara Machine & Tool Works	66-67
Nichols-Morris Corporation	48A
Nicholson File Company	48
Nilson Machine Co., A. H.	254
Norton Company	18-19, 64
Oakite Products Inc.	234
Oliver Instrument Company	306
O'Neil-Irwin Mfg. Co.	224
Orban Co. Inc., Kurt	226
Osborn Mfg. Co.	192D
Ottemiller Co., Wm. H.	340
Parker-Kalon Division-General American Transportation Corporation	314, 329
Pheoll Mfg. Co.	329
Philadelphia Gear Works	340, 346
Pines Engineering Co. Inc.	256B
Pittsburgh Gear Company	230
Pope Machinery Corp.	336
Portage Machine Co.	192
Potter & Johnston Co. Sub. Pratt & Whitney Co., Inc.	112
Pratt & Whitney Co. Inc.	113, 225, 228
Railway Express, Air Express Div.	224B
Raybestos Manhattan Inc.	207
Reich Mfg. Co., J. R.	336
Reliance Electric & Engineering Co.	313
Republic Steel Corp.	38-39
Revere Copper & Brass Inc.	205

(Continued on page 358)

STOCK DELIVERY

Mondiale Lathes

Over 750 sold in the United States



SIMPLEX MODEL BS 13¾" x 30" Engine Lathe

Model BS—13¾" x 30"; enclosed head; 12 spindle speeds 45/900 RPM; quick change gear; swing over bed 13¾"; over saddle 8⅜"; swing in gap 20¾"; hole in spindle 1⅜".

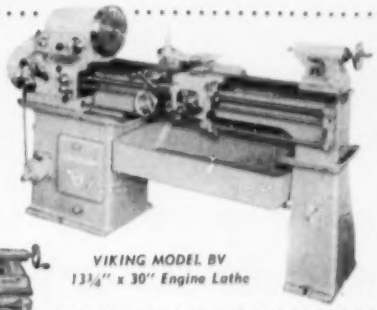
Model CS—13¾" x 40" centers.

Also available, Model JS—capacity; 10" x 20" centers; enclosed head; 16 spindle speeds 50/1600 RPM; tapered roller bearing spindle; quick change gear; swing over bed 10¼"; over saddle 5½"; hole in spindle 1-1/32".

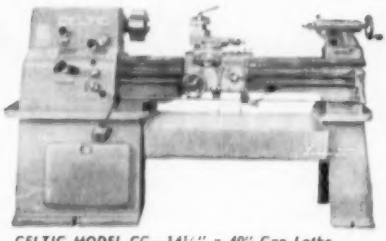
Model KS—10" x 30" centers.

Model BV—capacity; 13¾" x 30" centers; infinite variable speed head 35/1200 RPM; tapered roller bearings; quick change gear; swing over bed 13¾"; over saddle 7¼"; swing in gap 20¾"; hole through spindle 1⅜".

Model CV—13¾" x 40" centers.



VIKING MODEL BV 13¾" x 30" Engine Lathe



CELTIC MODEL CC—14½" x 40" Gap Lathe

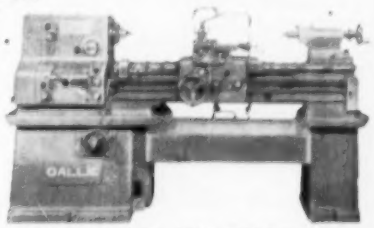
Model BC—capacity; 14½" x 30" centers; swing over bed 14½"; over cross slide 9-1/16"; in gap 21¼"; No. 5 Morse Taper.

Model DC—14½" x 60" centers.

Model BG—capacity; 14½" x 30" centers; swing over bed 14½; over cross slide 7⅞"; in gap 20⅞"; No. 5 Morse Taper.

Model CG—14" x 40" centers.

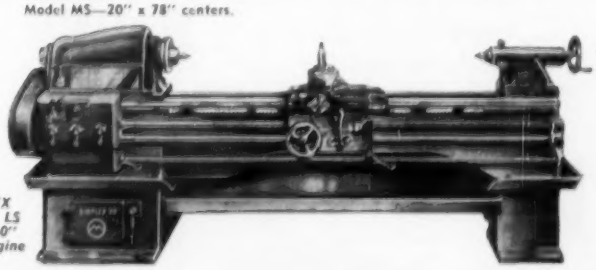
Model DG—14½" x 60" centers.



GALLIC MODEL BG—14½" x 30" Gap Lathe

Model LS—capacity 20" x 60" centers; swing over bed 20"; over cross slide 12"; swing in gap 30"; length of removable gap 9½"; 16 spindle speeds 10/800 RPM.

Model MS—20" x 78" centers.



SIMPLEX MODEL LS 20" x 60" Gap Engine Lathe

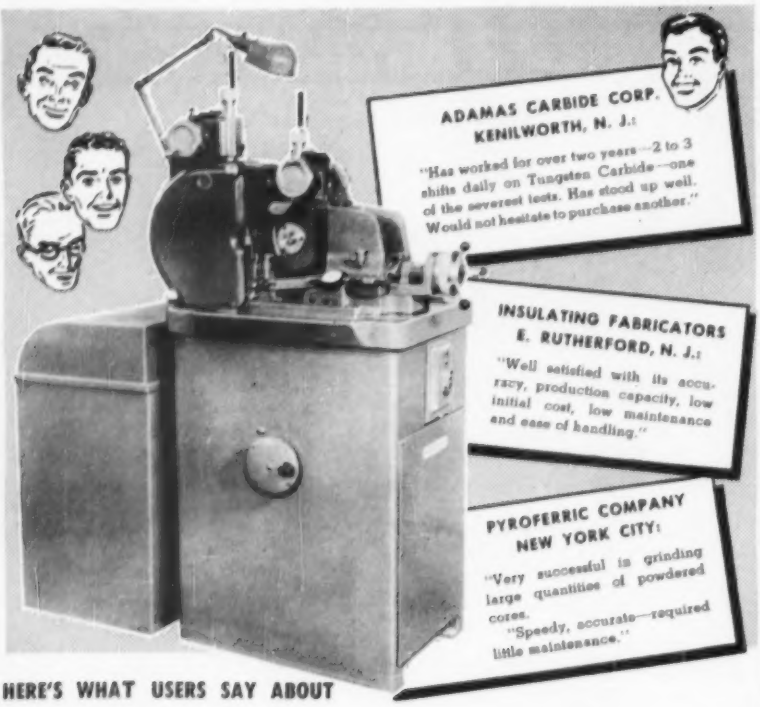
MOREY *...for machine tools!*

MOREY MACHINERY CO., INC.

Manufacturers • Merchants • Distributors

383 LAFAYETTE ST. • NEW YORK 3, N. Y.

ALGONQUIN 4-6560 • CABLE ADDRESS: WOODWORK, N.Y.


ADAMAS CARBIDE CORP.
KENILWORTH, N. J.:
"Has worked for over two years—2 to 3 shifts daily on Tungsten Carbide—one of the severest tests. Has stood up well. Would not hesitate to purchase another."
INSULATING FABRICATORS
E. RUTHERFORD, N. J.:
"Well satisfied with its accuracy, production capacity, low initial cost, low maintenance and ease of handling."
PYROFERRIC COMPANY
NEW YORK CITY:
"Very successful in grinding large quantities of powdered cores.
"Speedy, accurate—required little maintenance."

HERE'S WHAT USERS SAY ABOUT

THE *New* LOW COST Royal Master CENTERLESS GRINDER

Royal Master handles work up to 1" diameter—and many pieces up to 1½". Tolerances as low as .0002 constantly held. 6-8 micro inch finishes easily obtained. Requires only 24" x 58" of space.

The experience of these firms and others using the Royal Master Centerless Grinder proves its efficiency.

We will gladly demonstrate it grinding your product.

But best of all, the Royal Master is priced within the means of even the smallest machine shop. It can be working in your shop or department at up to 50% of what other centerless grinders will cost you.

Write today for 6 page descriptive folder and prices.

210 State Highway 23 **ROYAL MASTER INC.**

RIVERDALE, NEW JERSEY

— UNIVERSAL —
milling and boring attachment which can be fitted on Lathes

MATRA

MATRA-WERKE G.M.B.H. FRANKFURT/M. 301
GERMANY

INDEX TO ADVERTISERS

(Continued from page 357)

	Page
Rivett Lathe & Grinder Inc.	236
Rockford Machine Tool Company	232-233
Rotor Tool Co.	63
Royal Master Inc.	358
Ruthman Machinery Company	258
Saginaw Steering Gear Div. General Motors Corp.	319
Sales Service Machine Tool Co.	355
Scharmann Machine Corp.	327
Scherr Co. Inc., George	342
Sciaky Bros. Inc.	267
Scott Paper Company	Insert bet. 192A-192D
Scovill Mfg. Co.	329
Screw Research Association	329
Selas Corp. of America	324
Seneca Falls Machine Company	280-281
Shakeproof Div. Illinois Tool Works	329
Sheffield Corp.	276
Sheldon Machine Company	268
Shore Instrument & Mfg. Co., Inc.	359
Simonds Abrasive Co.	301
Simonds Saw & Steel Co.	307
Sinclair Refining Co.	295
Skil Corp.	248-249
Skinner Chuck Company	244
Snyder Tool & Engineering Co.	56-57
Socony Mobil Oil Co., Inc. and Affiliates	245
Sonnet Tool & Mfg. Company	326
South Bend Lathe Works	321
Southington Hdwe Mfg. Co.	329
Speed-D-Burr Corp.	294
Spincraft Inc.	220
Springfield Machine Tool Co.	94-95
Standard Horse Nail Corp.	342
Standard Oil Co. (Indiana)	197
Standard Pressed Steel Co.	72A
Standard Tool Company	47
Steelweld Machinery Division Cleveland Crane & Engineering Co.	118
Sterling Bolt Co.	329
Stewart-Warner Corp.	303
Stuart Oil Company, Ltd., D. A.	32B
Struthers-Wells Corp.	286-287
Stupakoff Division of Carborundum Company	58
Sundstrand Machine Tool Company	54-55
Sundstrand Magnetic Products Co.	346
Sun-Lite Mfg. Co.	261
Sun Oil Company	174
Superior Steel Products Corp.	325
Surface Combustion Corp.	223
Sweets Catalog Service	250
Tennessee Coal & Iron Div.	82-83
Threadwell Tap & Die Corp.	77
Timken Roller Bearing Co. Industrial Division	4th Cover
Triplex Machine Tool Corp.	336
Union Carbide & Carbon Corp.	192A, 243
Union Twist Drill Company	43
United States Steel Corp.	82-83

INDEX TO ADVERTISERS

	Page
United States Steel Export Co.	82-83
United States Steel Supply Div.	82-83
U.S. Tool Co., Inc.	96
Universal Engineering Corp.	305
V & O Press Co., Div. Emhart Mfg. Co.	238-239
Vaill Engineering Company	328
Valenite Metals Corporation	224
Van Keuren Co.	290
Van Norman Machine Co.	8-9
Vapor Heating Corporation	336
Vascaloy Ramet Corporation	195
Vickers, Incorporated Div. of Sperry-Rand Corporation	288
Virginia Gear & Machine Corp.	340, 346
Vlier Engineering, Inc.	172
Waldes Koh-I-Noor Inc.	100
Wales Beech Corp.	329
Walker-Turner Div. Kearney Trecker Corp.	216-217
Wallace Supplies Mfg. Company	328
Warner & Swasey Company	22-23
Webber Gage Co.	316
Wendt-Sonis Co.	218-219
Wesson Co.	Insert bet. 288-289
West Disinfecting Company	330
Westinghouse Electric Corp.	227
White & Bagley Company	277
Wiegand Co., Edwin L.	199
Williams & Co., J. H.	241
Wilson Air Collet Closer Inc.	332
Wilson Mechanical Instrument Div. American Chain & Cable Co.	237
Winter Brothers Co.	50
Woods Machine Co., S. A.	359
Woodworth Co., N. A.	299
Wysong & Miles Company	300

CLASSIFIED ADVERTISING

F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES 347, 352

SPECIAL SERVICES
- Contract Work 352
- General Pattern Works 352

EDUCATIONAL
- Books 352

BUSINESS OPPORTUNITIES
- Offered 351

EQUIPMENT
(Used or Surplus New)
- For Sale 348-351

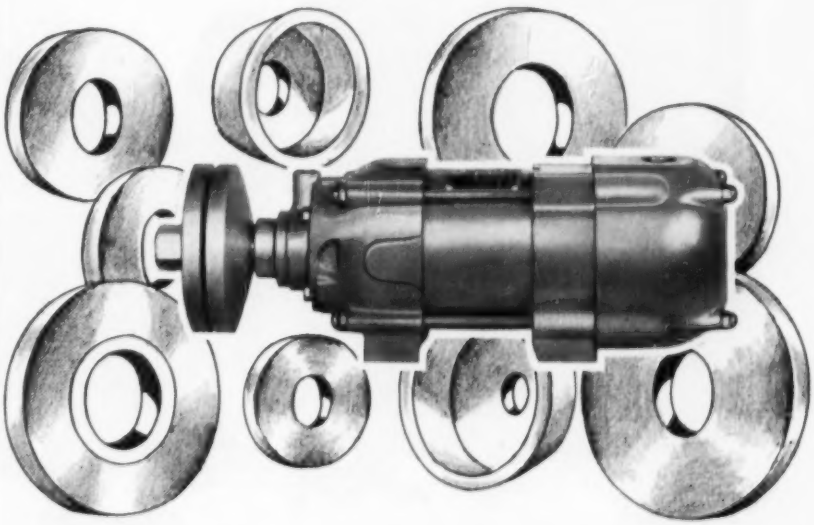
WANTED
- Equipment 348

ADVERTISERS INDEX

Bennett Machinery Co. 350
Cox Machinery Co., Inc. 348
Dony Machinery Co. 350
Eastern Machinery Co., Inc. 349
Electric Equipment Co. 348
Falk Mill Supply Co. 350
Ford & Associates 351
Hill-Clarke Machinery Co. 350
Hyman & Sons, Joseph 351
Indianapolis Machy & Supply Co. 350
Lehmann Co., J. M. 351
Machine Tool Publications 352
Miles Machinery Co. 351
Peacock Corp. 352
Phoenix, Arizona, Chamber of Commerce 347
Warner & Swasey Co. 347
Williams, E. H. 351

Serving the Industry Since 1832

POSITIVE POWER
with a WOODS MOTOR ARBOR



Rugged as a block of New England granite—smooth running as a Kentucky Derby winner—operates at a cost to win the approval of any Scotchman. This description applies to any WOODS Motor Arbor.

Precision built and "tape insulated", WOODS motors are available in a wide variety of types and range from one to one hundred horsepower. Extremely adaptable for use requiring precision balance, a minimum of space and delivering the maximum of power. Why not investigate the advantages of these time-and-money saving motor arbors for your plant today?

Send for descriptive material

MOTOR DIVISION

S. A. WOODS MACHINE CO.
27 DAMRELL STREET
BOSTON 27, MASS.

MODEL D

SHORE SCLEROSCOPE HARDNESS TESTERS

Pioneer American Standard SINCE 1907

Available in Model C-2 direct reading or in Model D dial indicating with equivalent Brinell and Rockwell C Hardness Numbers. May be used free hand or mounted on bench clamp. Sensitive over entire range from softest to hardest of metals without adjustment. Non-injurious to work.

OVER 40,000 IN USE

THE SHORE INSTRUMENT & MFG. CO., INC.
90-35B Van Wyck Exp.
Jamaica 35, N. Y.

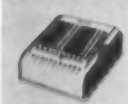
MODEL C-2

FOUND WHERE FINE BUSINESS MACHINES ARE "BORN"

GRAND RAPIDS GRINDERS

INTERNATIONAL BUSINESS MACHINES

SMITH-CORONA



COMPTOMETER

REMINGTON RAND

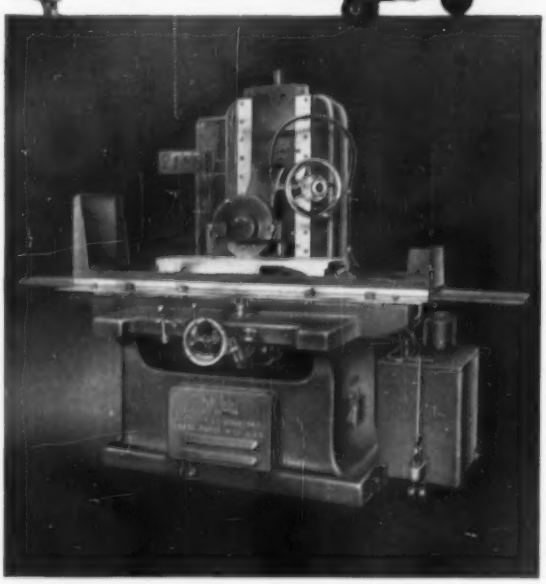
UNDERWOOD

R. C. ALLEN

Producing an intricate business machine requires exceptional toolroom precision. That's why these manufacturers use Grand Rapids Grinders . . . engineered to achieve extraordinary grinding precision at cost-cutting speed.

Model No. 55, at right, offers such features as one-piece column and base for permanent, vibrationless alignment, wheel head with powered rapid vertical travel, hydraulically actuated cross feed and longitudinal travel table. And it's the fastest grinder of its size and type, with a variable table speed up to 125 fpm!

Whether you make business machines or bulldozers, you can count on Grand Rapids Grinders for maximum toolroom precision.



GRAND RAPIDS NO. 55 HYDRAULIC FEED SURFACE GRINDER. Table speed up to 125 fpm. Working surface of table is 12" x 36". Vertical movement of wheel head is 18". Preloaded ball bearing spindle greased for life. Spindle speeds 1925 and 2500 rpm.

A note on your letterhead will bring complete details.

GALLMEYER & LIVINGSTON COMPANY

430 Straight Ave., S.W., Grand Rapids, Michigan

INSIDE INFO FROM HOLO-KROME

H-K's sharp socket corners resist reaming!

THE SECRET'S IN THE SOCKET!

Sharp hex socket corners mean less reaming—the payoff's on the production line with fewer damaged screws, less downtime and improved product appearance!

Compare These Other H-K Features!

COMPLETELY FORGED SOCKET HEAD . . . no drilling or broaching—metal fibers stay intact for stronger hex sockets.

SCIENTIFICALLY DESIGNED SOCKETS . . . depth carefully proportioned to give greatest head and socket strength, firmest key grip.

UNTAPERED WALLS . . . for better key fit, longer key and socket life, even tighter wrenching.

For the finest in Socket Screw products . . . for revolutionary SAME-DAY SERVICE, the name to remember is Holo-Krome!

LOOK INSIDE A HOLO-KROME SOCKET!

Send in the coupon below and we'll send you FREE an H-K Socket Cap Screw (we've omitted heat treating to let you get a better look at the mirror finish and sharp hex corners under the usual black finish). Look it over carefully, and see for yourself what a real difference H-K quality and skill can make!

Please send me FREE a Holo-Krome Socket Screw for my inspection.

NAME _____

POSITION _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

HOLO-KROME

THE HOLO-KROME SCREW CORP., HARTFORD 10, CONN.

Sold only through authorized Holo-Krome distributors.

Forms metal by new cold flowing process–TIMKEN® bearings assure wall thickness within ±.002"

FLOTURN, a radically new metal-working process developed by Lodge & Shipley, applies continuous pressure to a metal blank, forming it to the shape of a mandrel. It's an extremely accurate process. Even under heavy loads at high speeds, this L & S No. 40 FLOTURN Lathe holds wall thickness tolerances to ±.002".

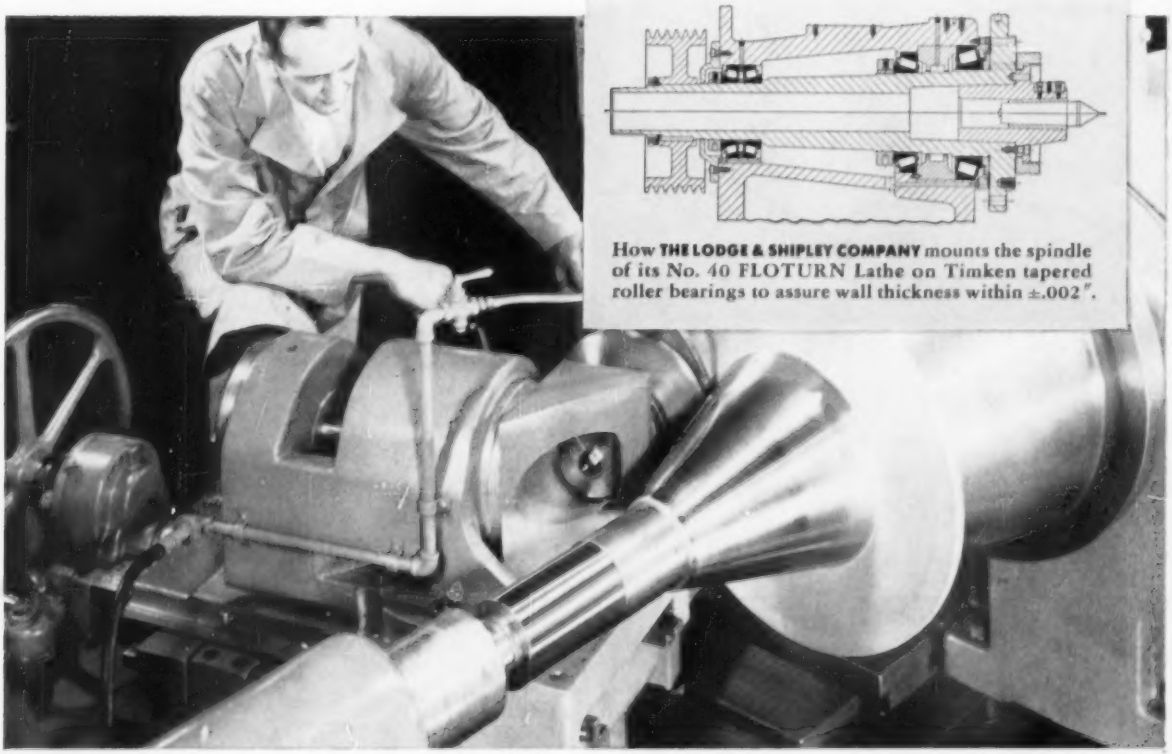
One big reason for this accuracy is the Timken® tapered roller bearings on the spindle. The tapered construction of Timken bearings lets them take the heavy radial and thrust loads in any combination—holds the spindle in rigid alignment. And line contact between the rollers and races of Timken bearings gives them extra load-carrying capacity — important since the metal is shaped by very high pressures.

Timken bearings practically eliminate friction, saving power. The geometrically correct design of Timken bearings gives them true rolling motion; their accuracy lives up to that design.

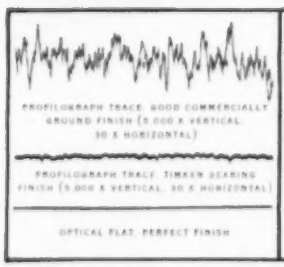
Under normal usage, Timken bearings last the life of the machine tool. One reason is that they're made of Timken fine alloy steel. We have to make the steel ourselves, because that's the only way we can completely control quality. We're the only American manufacturer that does.

Whatever machine tool you build or buy, be sure it's equipped with Timken tapered roller bearings. Always look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



How **THE LODGE & SHIPLEY COMPANY** mounts the spindle of its No. 40 FLOTURN Lathe on Timken tapered roller bearings to assure wall thickness within ±.002".


PROFILOGRAPH TRACE, GOOD COMMERCIALLY GROUND FINISH (5,000 X VERTICAL, 50 X HORIZONTAL)
PROFILOGRAPH TRACE, TIMKEN BEARING FINISH (5,000 X VERTICAL, 50 X HORIZONTAL)
OPTICAL FLAT, PERFECT FINISH

SMOOTH TO MILLIONTHS OF AN INCH

Surface finish of high quality Timken bearing rollers and races is so smooth that it takes a profilograph to measure its smoothness. This instrument measures surface variations to a millionth of an inch, as shown at the left.

TIMKEN

(TRADE-MARK REG. U.S. PAT. OFF.)

TAPERED ROLLER BEARINGS

NOT JUST A BALL ◯ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ▯ AND THRUST ▯ LOADS OR ANY COMBINATION